

**FM 20-3**  
**14 NOVEMBER 1990**

By Order of the Secretary of the Army:

**CARL E. VUONO**  
General, United States Army  
Chief of Staff

Official:


**THOMAS F. SIKORA**  
Brigadier General, United States Army  
The Adjutant General

**DISTRIBUTION:**

*Active Army, USAR, and ARNG:* To be distributed in accordance with DA Form 12-1 I-E, requirements for FM 20-3, Camouflage (Qty rqr block no. 4825), FM 5-20, Camouflage (Qty rqr block no. 0021); TC 5-200, Camouflage Pattern Painting (Qty rqr block no. 1262); and DA Form 12-34B-R, requirements for TM 5-200, Camouflage Materials (Qty rqr block no. 0650).

# CAMOUFLAGE

## Contents

	Page
Preface . . . . .	vii
<b>Part One—BASICS OF CAMOUFLAGE</b>	
<b>Chapter 1. Camouflage Concepts</b>	
<b>1-1 Doctrinal Considerations . . . . .</b>	<b>1-1</b>
Preventing Detection . . . . .	1-1
Improving Survivability . . . . .	1-1
Improving Deception Capabilities . . . . .	1-1
 Integrating Smoke Operations . . . . .	1-1
<b>1-2 Responsibilities . . . . .</b>	<b>1-2</b>
The Soldier . . . . .	1-2
The Commander . . . . .	1-2
<b>1-3 Camouflage Priorities . . . . .</b>	<b>1-2</b>
Recognizing Technological Impact . . . . .	1-2
Determining Priorities . . . . .	1-2
<b>1-4 Training . . . . .</b>	<b>1-3</b>
Individual Training . . . . .	1-3
Unit Training . . . . .	1-3
Training Evaluation . . . . .	1-3
<b>1-5 Fratricide . . . . .</b>	<b>1-4</b>
<b>1-6 Material . . . . .</b>	<b>1-4</b>

DISTRIBUTION RESTRICTION: Approved for public release; distribution is unlimited.

*\*This manual supersedes FM 5-20, 20 May 1968; TC 5-200, 28 August 1975; and TM 5-200, 10 April 1968.*

**Chapter 2. Threat**

**2-1 Data Collection** . . . . . 2-1  
     Target Acquisition . . . . . 2-1  
     Intelligence Production . . . . . 2-1  
**2-2 Organization** . . . . . 2-1  
     Troops . . . . . 2-1  
     Motorized Rifle and Tank Regiments . . . . . 2-1  
     Maneuver Divisions . . . . . 2-1  
**2-3 Doctrine** . . . . . 2-2  
     Observation Posts . . . . . 2-2  
     Patrols . . . . . 2-2  
     Raids . . . . . 2-2  
**2-4 Sensor Systems** . . . . . 2-2  
     Classification . . . . . 2-2  
     Visual Sensors . . . . . 2-2  
     Near-Infrared (NIR) Sensors . . . . . 2-3  
     IR Sensors . . . . . 2-3  
     UV Sensors . . . . . 2-4  
     Radar . . . . . 2-4  
     Acoustic Sensors . . . . . 2-4  
     Radio Sensors . . . . . 2-5

**Chapter 3. Fundamentals of Camouflage**

**Section I. Counterdetection Techniques**

**3-1 Avoiding Detection** . . . . . 3-1  
**3-2 Identifying the Threat** . . . . . 3-1  
**3-3 Avoiding Detection by Routine Surveillance** . . . . . 3-2  
**3-4 Taking Countermeasures** . . . . . 3-2  
**3-5 Applying Realistic Camouflage** . . . . . 3-2  
     Visual Sensors . . . . . 3-2  
     Near-Infrared (NIR) Sensors . . . . . 3-2  
     IR Sensors . . . . . 3-2  
     UV Sensors . . . . . 3-2  
     Radar . . . . . 3-3  
     Acoustic Sensors . . . . . 3-3  
     Radio Sensors . . . . . 3-3

	<b>Page</b>
<b>3-6 Minimizing Movement</b> . . . . .	.3-4
<b>3-7 Using Decoys</b> . . . . .	.3-3
<b>3-8 Continuously Avoiding Detection</b> . . . . .	.3-4
<b>3-9 Avoiding Operational Patterns</b> . . . . .	.3-4

## **Section II. Detection Factors**

<b>3-10 Factors</b> . . . . .	.3-4
<b>3-11 Shape</b> . . . . .	.3-5
<b>3-12 Shadow</b> . . . . .	.3-5
<b>3-13 Color</b> . . . . .	.3-5
<b>3-14 Texture</b> . . . . .	.3-5
<b>3-15 Patterns</b> . . . . .	.3-5
Equipment Patterns . . . . .	.3-5
Terrain Patterns . . . . .	.3-5
<b>3-16 Movement</b> . . . . .	.3-5
<b>3-17 Temperature</b> . . . . .	.3-5
<b>3-18 Radar Return</b> . . . . .	.3-5

## **Section III. Camouflage Principles**

<b>3-19 Site Selection</b> . . . . .	.3-6
Mission . . . . .	.3-6
Dispersion . . . . .	.3-6
Terrain Patterns . . . . .	.3-6
<b>3-20 Concealment</b> . . . . .	.3-6
Hiding . . . . .	.3-6
Blending . . . . .	.3-6
Disrupting . . . . .	.3-7
Disguising . . . . .	.3-7
<b>3-21 Camouflage Discipline</b> . . . . .	.3-7
Light- and Heat-Source Discipline . . . . .	.3-7
Noise Discipline . . . . .	.3-7
Spoil Discipline . . . . .	.3-7

**Part Two—CAMOUFLAGE DURING TACTICAL OPERATIONS**

**Chapter 4. Camouflage Techniques**

**4-1 Natural Conditions** . . . . .4-1  
     Terrain . . . . .4-1  
     Limited Visibility . . . . .4-2  
     Data Sources . . . . .4-2  
**4-2 Camouflage Materials** . . . . .4-2  
     Pattern-Paints for Equipment . . . . .4-2  
     LCSS . . . . .4-2  
     Vegetation . . . . .4-3  
     Expedient Paints . . . . .4-3  
**4-3 Camouflage Discipline** . . . . .4-3

**Chapter 5. Offensive Operations**

**5-1 Camouflage During Offensive Preparations** . . . . .5-1  
     Considerations . . . . .5-1  
     Signatures . . . . .5-1  
**5-2 Preparations** . . . . .5-1  
     Assembly Areas . . . . .5-1  
     Decoys . . . . .5-2  
     Troop and Supply Movements . . . . .5-2  
     Line Crossings . . . . .5-3  
     Deception Operations . . . . .5-3  
**5-3 Camouflage During the Battle** . . . . .5-3  
     Movement Considerations . . . . .5-3  
     Breaching Operations . . . . .5-3

**Chapter 6. Defensive Operations**

**Section I. Camouflage During Defensive**

**6-1 Objectives** . . . . .6-1  
**6-2 Signatures** . . . . .6-1  
**6-3 Reserve and Counterattack Forces** . . . . .6-1  
     Planning . . . . .6-1  
     Movement . . . . .6-2

	<b>Page</b>
Assembly Areas . . . . .	.6-2
Placement and Dispersal . . . . .	.6-2
<b>6-4 LCSS . . . . .</b>	<b>.6-3</b>
<b>6-5 Stoves and Fires . . . . .</b>	<b>.6-3</b>
<b>6-6 Communications . . . . .</b>	<b>.6-3</b>
<b>6-7 Camouflage Discipline . . . . .</b>	<b>.6-3</b>

## Section II. Survivability Positions and Obstacles

<b>6-8 Description . . . . .</b>	<b>.6-3</b>
<b>6-9 Placement . . . . .</b>	<b>.6-3</b>
<b>6-10 Backgrounds . . . . .</b>	<b>.6-4</b>
<b>6-11 Natural Camouflage . . . . .</b>	<b>.6-4</b>
<b>6-12 Camouflage During Battle . . . . .</b>	<b>.6-4</b>

## Chapter 7. Camouflage of High-Value Targets

<b>7-1 Command Posts (CPs) . . . . .</b>	<b>.7-1</b>
Signatures . . . . .	.7-1
Camouflage . . . . .	.7-2
Sites . . . . .	.7-2
Radiotelephone Procedures . . . . .	.7-2
Camouflage Discipline . . . . .	.7-2
<b>7-2 Supply and Water Points . . . . .</b>	<b>.7-3</b>
Operations . . . . .	.7-3
Camouflage . . . . .	.7-3
Traffic Control . . . . .	.7-3
Water-Point Considerations . . . . .	.7-3
<b>7-3 Fixed Installations . . . . .</b>	<b>.7-4</b>
Concept . . . . .	.7-4
Camouflage Plans . . . . .	.7-6
<b>7-4 Nuclear-Delivery Units . . . . .</b>	<b>.7-7</b>
Mobility and Camouflage . . . . .	.7-7
Built-In Capabilities . . . . .	.7-7
Critical Nature . . . . .	.7-8

## Chapter 8. Camouflage in Special Environments

<b>8-1 Desert . . . . .</b>	<b>.8-1</b>
Topography . . . . .	.8-1

	<b>Page</b>
Shadows . . . . .	.8-1
Placement . . . . .	.8-1
Terrain Mottling . . . . .	.8-1
Camouflage and Movement Discipline . . . . .	.8-2
Noise and Light Discipline . . . . .	.8-2
<b>8-2 Snow-Covered Areas . . . . .</b>	<b>.8-2</b>
Paint . . . . .	.8-2
Placement . . . . .	.8-2
Movement . . . . .	.8-2
Thermal Signatures . . . . .	.8-2
<b>8-3 Urban Terrain . . . . .</b>	<b>.8-2</b>
Planning . . . . .	.8-3
Site Selection . . . . .	.8-3
Establishing Fighting Positions . . . . .	.8-3
Placing Vehicles . . . . .	.8-3
 <b>Appendix A . . . . .</b>	 <b>A-1</b>
Guidelines for Standing Operating Procedures (SOPs)	
 <b>Appendix B</b>	
Camouflage Requirements and Procedures	
Section I. Lightweight Camouflage Screen System . . . . .	.B-1
Section II. Sample LCSS Battle Drill (Infantry Fighting Vehicle, M2) . . . . .	.B-6
 <b>Appendix C . . . . .</b>	 <b>.C-1</b>
The Geneva Emblem and Camouflage of Medical Facilities	
 <b>Appendix D . . . . .</b>	 <b>D-1</b>
Individual Camouflage	
 <b>Glossary . . . . .</b>	 <b>.Glossary-1</b>
 <b>References . . . . .</b>	 <b>.References-1</b>
 <b>Index . . . . .</b>	 <b>.Index-1</b>

## Preface

This manual is intended to give the company-level leaders an understanding of camouflage principles. In order to remain viable forces, all units must be capable of adequately camouflaging themselves and their equipment. To ignore a threat's ability to detect our offensive and defensive operations on the battlefield can only result in disaster. In order for our units to survive on the battlefield, they must be well versed in camouflage concepts and techniques.

Camouflage is as important as marksmanship, maneuver, and mission. It is an integral part of the soldier's duty. Camouflage not only encompasses individual efforts, but those efforts conducted by the entire unit, such as movement discipline, light and noise discipline, litter control, dispersal, cover and concealment, deception, and smoke operations. Everything the soldier or his unit uses on the battlefield must adhere to the principles of camouflage if they are to survive.

Survivability is the goal. The unit commander must encourage each soldier to think of survivability and camouflage as synonymous terms. Training soldiers to recognize this correlation will give them a better understanding of the need to be proficient in camouflage techniques.

---

The proponent of this publication is HQ, TRADOC. Submit changes for improving this publication on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward it to Commandant, US Army Engineer School, ATTN: ATSE-TDM-PP, Fort Leonard Wood, Missouri 65473-6650.

The provisions of this publication are the subject of international agreement: STANAG 293 OP, *Camouflage of the Geneva Emblem and Medical Facilities on Land*.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

This publication contains copyrighted material.



---

## PART ONE BASICS OF CAMOUFLAGE

### Chapter 1 Camouflage Concepts

*Camouflage is the use of concealment and disguise to minimize the detection or identification of troops, weapons, equipment, and installations. It includes taking advantage of the immediate environment as well as using natural and artificial materials. One of the imperatives of AirLand Battle doctrine is to conserve friendly strength for decisive action. Such conservation is aided through sound operations security (OPSEC) and protection from attack. This includes all actions that make soldiers, equipment, and units difficult to locate. Camouflage is one such action.*

**1-1. Doctrinal Considerations.** Using camouflage will help the commander in the following ways:

a. *Preventing Detection.* Camouflage degrades the effectiveness of enemy reconnaissance, surveillance, and target acquisition (RSTA) capabilities. Skilled observers and sophisticated sensors can be defeated by obscuring the telltale signs (signatures) by which units on the battlefield may be detected and identified. Preventing acquisition by threat observers will make it difficult for threat forces to determine friendly operational patterns, functions, and capabilities.

b. *Improving Survivability.* Camouflage, by reducing the enemy's ability to detect, identify, and engage US Army elements, enhances friendly survivability. Survivability encompasses all actions taken to conserve personnel, weapons, facilities, and supplies from the effects of enemy weapons and actions. Survivability includes physical measures such as fighting and protective positions; nuclear, biological, chemical (NBC) equipment; and armor. These actions include interrelated tactical measures such as dispersion, movement techniques, OPSEC, communications security (COMSEC), tactical missile defense, smoke operations, deception, and camouflage and concealment. Improved survivability from camouflage is not restricted to combat operations. There is also benefit in denying the enemy the collection of information about friendly forces during peacetime.

c. *Improving Deception Capabilities.* Camouflage also enhances the effectiveness of deception in military operations. Camouflage and deception help mask the real intent of primary combat operations and aid in achieving surprise. Camouflage measures can delay effective enemy reaction by disguising information about friendly intentions, capabilities, objectives, and locations of vulnerable units and facilities. Conversely, intentionally poor camouflage can project misleading information about friendly operations. Successful deception depends on stringent OPSEC, which

includes effective camouflage. For more detailed information on deception operations, see FM 90-2.

d. *Integrating Smoke Operations.* Smoke and obscurants are effective tools for enhancing other camouflage techniques. Smoke and obscurants can change the dynamics of the battle by blocking or degrading the spectral bands used by Threat target-acquisition and weapons systems. Near- and midterm developments of smoke and obscurants will include the capability to degrade nonvisual detection systems. FM 3-50 contains detailed information on planning smoke operations.

**1-2. Responsibilities.** Each soldier and commander is responsible for camouflage. Every soldier and unit must become proficient in camouflage techniques; there is no unit specifically assigned or dedicated to conducting camouflage operations.

a. *The Soldier.* The individual soldier is responsible for concealing himself and his equipment. Just as marksmanship enables soldiers to hit targets, camouflage enables them to avoid becoming targets.

b. *The Commander.* The commander is responsible for the camouflage of his unit. NCOs supervise well-disciplined soldiers in executing such camouflage. They use established standing operating procedures (SOPs) and battle drills to guide their efforts.

### **1-3. Camouflage Priorities.**

a. *Recognizing Technological Impact.* Every soldier and military unit has an inherent mission of self-protection and should use all available means for camouflage. However, camouflage measures have become more complicated due to advancing technology. Commanders must recognize that advanced technologies have—

- Enhanced the performance of hostile reconnaissance and surveillance equipment.
- Increased the Threat's ability to use signatures for detecting friendly units.
- Reduced the time available to apply camouflage due to the increased speed at which units must perform nearly all aspects of battlefield operations.

b. *Determining Priorities.* When time, camouflage materiel, or other resources are insufficient to provide adequate support to all units, commanders must determine the priorities of camouflage operations. Considerations for establishing these priorities involve analyzing the mission, enemy, troops, terrain, and time available (METT-T). The following sets forth a METT-T analysis for determining camouflage priorities:

(1) **Mission.** The mission is always the first and most important consideration. Camouflage efforts must enhance the mission but not be so elaborate that they hinder the mission.

(2) **Enemy.** The enemy's RSTA capabilities will influence the type and amount of camouflage needed to support the unit's mission. Whenever possible, an intelligence analysis should include the types of RSTA equipment the enemy uses.

(3) **Terrain.** The terrain dictates what camouflage techniques and materials are necessary. Skillful use of the terrain's cover and concealment properties has a decisive significance in camouflage. Different terrain types (such as urban, mountain, forest, plains, desert, and arctic) require specific camouflage techniques.

(4) **Troops.** Friendly troops must be well-trained in camouflage techniques that apply to their mission, unit, and equipment. A change in environment or mission will often require the retraining of soldiers. Leaders must also consider the alertness of troops. Careless efforts at camouflage are ineffective and may disclose the unit's location. The analysis should address the relative detectability of friendly equipment, as well as the signatures that the unit normally transmits.

(5) **Time.** Time is often the critical factor. Elaborate camouflage may not be practical for the tactical situation. The type and amount of camouflage needed are determined by the time the unit will occupy the area, the amount of time available to camouflage, and the amount of time necessary to recamouflage the unit after it moves.

#### **1-4. Training.**

a. *Individual Training.* Camouflage training must take place as part of every field exercise. Soldiers must be aware that the threat can detect, identify, and acquire targets by using technologies well beyond the visual part of the electromagnetic spectrum. Each member of the unit must acquire and maintain specific camouflage skills. These include the ability to analyze and effectively use terrain; to properly select an individual site; and to hide, blend, disrupt, and disguise signatures by using both natural and artificial materials.

b. *Unit Training.* Unit camouflage training refines individual and leader skills, introduces the element of team coordination, and contributes to tactical realism. If camouflage is to help conserve friendly strength, it must be practiced with the highest degree of discipline. Camouflage; concealment; light, noise, and communications discipline; and signal security must be practiced and evaluated in an integrated mission training environment. Camouflage proficiency is developed through practice. Units must incorporate camouflage into their field SOPs that address the *who*, *what*, *where*, *when*, and *how* of camouflage. Appendix A provides additional guidance on integrating camouflage into unit field SOPs.

c. *Training Evaluation.* An evaluation of camouflage training should be as realistic as possible. Integrate unit training with evaluations to provide reinforcement and enhance training. The following techniques will enhance training evaluation:

- Have small-unit leaders evaluate their unit's camouflage efforts from the enemy's viewpoint. How a position looks from a few meters is probably of little importance. Could an approaching enemy detect and place aimed fire on the position? From what

distance could the enemy detect the position? Which camouflage principle was ignored that allowed detection?

- Whenever possible, use binoculars, night vision, or thermal devices to show units how they would look to an enemy.
- Use photographs or video tapes of positions as a method of self-evaluation.
- Incorporate ground-surveillance radar (GSR) teams in training whenever possible. Let troops know how the GSR works, then have them try to defeat it.
- Request aerial photography of your unit's positions. These photos will show how the position would look to enemy aerial reconnaissance.
- Use an opposing force (OPFOR) to make training more realistic. Supporting aviation, in an OPFOR role, can also help. Whenever possible, unit leaders should be allowed to debrief the OPFOR. They should ask what factors enabled the OPFOR to locate, identify, and engage the unit, and what the unit could have done to improve its concealment.

**1-5. Fratricide.** Warfare often causes losses resulting from erroneously conducted operations against friendly troops. Fratricide compels commanders to consider the effect camouflage and deception operations will have on the necessity of being recognized by friendly troops.

**1-6. Material.** US Army policy prescribes that camouflage aids be built into equipment and supplies as much as possible. Battle-dress uniforms (BDUs), camouflage paint, light-weight camouflage screen systems (LCSSs), and other camouflage equipment provide aid in achieving good camouflage. These aids, however, are effective only if properly used and integrated with natural camouflage. Camouflage aids should not interfere with the battlefield performance of the soldiers, equipment, and installations they conceal.

## Chapter 2

### Threat

*The enemy uses a variety of sensors to detect and identify US soldiers, equipment, and supporting installations. These sensors use visual, ultraviolet (W), infrared (IR), radar, acoustic, and radio technologies. They may be employed by dismounted soldiers or ground- or airborne-mounted platforms. Such platforms are often capable of supporting multiple sensors. We will rarely know the specific systems the enemy will employ. Whenever possible, protect against all known Threat surveillance systems.*

**2-1. Data Collection.** The Threat collects information about US forces for two basic reasons:

a. *Target Acquisition.* Modern Threat weapons systems often have sensors capable of locating and identifying targets. All soldiers and units should protect themselves from target acquisition.

b. *Intelligence Production.*

(1) *Predicting Future Activities.* The Threat uses its sensor systems to locate and identify large US Army formations and headquarters and to predict their future activities. Threat detection of our activities in the rear area, such as at logistics centers, also reveals our intentions.

(2) *Tactical Reconnaissance.* The Threat uses tactical reconnaissance to provide additional information on US forces' dispositions and the terrain in which they operate. Threat tactical reconnaissance also attempts to identify targets for later attack by long-range artillery, rockets, and aircraft.

**2-2. Organization.** The Threat conducts reconnaissance activities at all echelons. Troop reconnaissance is usually conducted by specially trained units. The following summarizes the types of Threat units that have specific intelligence collection missions:

a. *Troops.* The Threat uses ordinary combat troops to perform reconnaissance; one company per battalion specifically trains to conduct reconnaissance operations behind enemy lines.

b. *Motorized Rifle and Tank Regiments.* Each of these units has a reconnaissance company and a chemical reconnaissance platoon.

c. *Maneuver Divisions.* Divisions have a reconnaissance battalion, an engineer reconnaissance platoon, a chemical reconnaissance platoon, and a target-acquisition battery.

### **2-3. Doctrine.**

a. *Observation Posts.* Threat doctrine provides for each battalion to continuously maintain two observation posts when in close contact with OPFOR. An additional command and observation post is established when the battalion is in the defense or preparing an offensive.

b. *Patrols.* Patrolling is employed extensively but particularly during offensive operations. The Threat uses patrols to detect the location of opposing indirect- and direct-fire weapons, gaps in formations, and obstacles and bypasses.

c. *Raids.* Threat forces use raids to capture prisoners, documents, weapons, and equipment. A reconnaissance-in-force (usually by a reinforced company or battalion) is the most likely tactic when other methods of tactical reconnaissance have failed. The purpose of the reconnaissance-in-force is usually to deceive us into thinking that we are being attacked, causing us to reveal our defensive positions.

**2-4. Sensor Systems.** The Threat uses many different types of electronic surveillance equipment. The following is a discussion of Threat surveillance capabilities:

a. *Classification.* Sensor systems are classified according to the part of the electromagnetic (EM) spectrum in which they operate. Figure 2-1 shows the parts of the EM spectrum that are of concern to soldiers. Sensor systems are also categorized as either active or passive.

(1) *Active.* Active sensors emit energy that reflects from targets and is recaptured by the emitting or other nearby unit, indicating the presence of a target. Examples of active sensors are searchlights and radars.

(2) *Passive.* Passive sensors emit no energy. This type of sensor collects energy, which may indicate the presence of a target. Examples of passive sensors are the human eye, night vision devices, and photographs.

b. *Visual Sensors.* Visual sensors work in the parts of the EM spectrum that are visible to the human eye. Enemy soldiers' eyes are the most plentiful sensors on the battlefield. Their vision may be aided by binoculars, telescopic sights, and image intensifiers. Civilian populations, enemy agents, reconnaissance teams, and patrols are visual sensor systems from the enemy's intelligence viewpoint.

(1) *Image Intensifiers.* Image intensifiers are passive night observation devices that amplify low-level light present on even the darkest night. These devices are used for surveillance and as weapon sights on small arms and vehicles. Airborne platforms are also capable of supporting image intensifiers.



(2) IR Films. Special IR films record temperature differences. Reconnaissance aircraft usually employ this type of sensor system.

e. *UV Sensors*. UV is the part of the EM spectrum just below visible light. UV sensors are more important in snow-covered areas because snow reflects UV waves well and most white paints and man-made objects do not reflect UV waves very well. Photographic intelligence systems with simple UV filters will highlight military objects as dark areas against snow-covered backgrounds. Camouflage in snow-covered backgrounds requires specially designed camouflage that provides a high UV reflectance.

f. *Radar*. Radar uses radio waves to penetrate fog, mist, smoke, and even canvas and wood. Radar works by transmitting a very strong burst of radio waves, then receiving and processing the reflected waves. In general, metal objects reflect radar waves well, while radar waves are absorbed by or pass through most other objects. The shape and size of a metal object will determine the strength of the reflected signal. A large metal object generally reflects more signal than a small object. Therefore, large metal objects can be detected from greater distances. The method by which the received radio wave is processed determines the type of radar. Radar systems commonly used against ground forces on the battlefield include—

(1) Moving Target Indicators (MTIs). When any EM wave hits something that is moving, it is reflected and changes frequency. The faster the object moves, the more the frequency changes. The simplest and most common battlefield radars detect this frequency change. The radar unit changes the signal into a sound for the radar operator to hear. Threat forces use this type of radar for target acquisition.

(2) Imaging Radars. An imaging radar's receiver and processor are so sensitive that an image of the detected object is displayed on a scope. Imaging radar is generally used on airborne platforms, such as side-looking airborne radar (SLAR).

(3) Countermortar and Counterbattery (CM and CB) Radars. CM and CB radars usually transmit two beams of energy that sweep above the horizon. An artillery or mortar round or a rocket passing through the beams reflects two signals that are received and plotted to determine the origin of the round.

g. *Acoustic Sensors*. There are two types of enemy acoustical systems:

(1) Human Ear. Every soldier, whether engaged in normal operations or at a listening post, is an acoustic sensor. However, the human ear is easily deceived and relatively inaccurate. Visual confirmation is usually required.

(2) Flash-Sound Ranging. Flash-sound ranging is used against artillery. Light travels at a much faster speed than sound. By accurately measuring the time between seeing a muzzle flash and the arrival of the sound, enemy sound-ranging teams can accurately measure the distance to the



gun tube. If two or more sound-ranging teams hear the sound, the sound-ranging analyst simply plots the ranges on a map as arcs. The target is located where the plotted arcs intersect.

h. *Radio Sensors.* The Threat makes a great effort to search for, detect, and locate the sources of US radio communications. Threat forces use various direction-finding techniques to locate opposing emitters. Once an emitter is detected, the enemy can take a number of actions, ranging from simply intercepting the transmissions to jamming or targeting the emitter for destruction. See FM 34-1 for more details.

## Chapter 3

### Fundamentals of Camouflage

*To remain a viable force on the battlefield, units must understand the fundamentals of camouflage. Camouflage skills are essential to survivability. To camouflage effectively, soldiers must constantly consider the enemy's point of view. What will he see? What characteristics will his sensors detect? Placing a low priority on camouflage because of time constraints or inconvenience could result in mission failure.*

#### Section I. Counterdetection Techniques

**3-1. Avoiding Detection.** The primary goal of camouflage is to avoid detection by the enemy. However, in some cases camouflage may succeed by merely preventing the enemy from identifying the target. While the enemy may know *something* is there, failure to identify what that *something* is may prevent the enemy from gaining any advantage. The preferred camouflage objective is to avoid detection, but sometimes avoiding identification is sufficient. There are eight rules to follow when considering how to avoid detection or identification:

- Identify the Threat's capabilities.
- Avoid detection by the Threat's routine surveillance.
- Take countermeasures against selected Threat sensors.
- Apply realistic camouflage.
- Minimize movement.
- Use decoys properly.
- Continuously avoid detection.
- Avoid operational patterns.

**3-2. Identifying the Threat.** Obtain as much information as possible about the enemy's surveillance capability. The S2's intelligence preparation of the battlefield (IPB) should include those sensors the enemy uses in a particular theater. If possible, obtain information on the enemy's tactical employment of the sensors. Next, assess the impact of the enemy's surveillance potential on the target under consideration. This assessment will vary with the relative position of the sensor and target on the battlefield, the role of the target, and the physical characteristics of the sensor and target.

**3-3. Avoiding Detection by Routine Surveillance.** Sophisticated sensors often have narrow fields of view. Furthermore, sensors can be very expensive and are unlikely to be deployed in such numbers as to enable coverage of the whole battlefield at all times. Sophisticated sensors are most likely to be deployed in those areas where the enemy suspects targets. The enemy may suspect an area either because of detection by less sophisticated, wider-coverage sensors or because of tactical analysis. Therefore, an important aspect of remaining undetected is to avoid arousing the suspicions of routine surveillance.

**3-4. Taking Countermeasures.** In some cases it might be appropriate to take action against identified enemy sensors. The ability to take countermeasures depends on a number of factors: the effective range of friendly weapons, the distance to the enemy sensor, and the relative cost in resources versus the benefits of preventing the enemy's use of the sensor. An additional factor to consider is that the countermeasure itself may provide the enemy with an indication of friendly intentions.

**3-5. Applying Realistic Camouflage.** The closer the target matches its background, the harder it is for the enemy to distinguish the target from its background. This principle of camouflage applies to all senses and all regions of the EM spectrum. Effective camouflage requires an awareness of one's surroundings, proper camouflage skills, and the ability to visualize those signatures that enemy sensors will detect. The following discusses countering each type of sensor employed by Threat forces:

a. *Visual Sensors.* The most plentiful, reliable, and timely enemy sensors are visual. Therefore, camouflaging to prevent visual observation is extremely important. What cannot be seen is difficult to detect, identify, and hit. BDUs, standard camouflage screening paint patterns (SCSPP), LCSS, and battlefield obscurants enhance visual camouflage. All-around camouflage helps to avoid detection by the Threat. However, when time is short, camouflage to the front, overhead, sides, and then to the rear.

b. *NIR Sensors.* NIR sights are effective at shorter ranges than the Threat's main guns, typically only to 900 meters. While red filters help preserve night vision, they cannot prevent NIR from detecting light from long distances. Therefore, minimize the use of red filters, or use blue-green filters. BDUs, LCSS, battlefield obscurants, and camouflage paints are designed to help defeat NIR sensors.

c. *IR Sensors.* Natural materials and cover (terrain) shield heat sources from IR sensors and break up the shape of cold or warm military objects viewed on IR sensors. Do not raise vehicle hoods to break windshield glare as this exposes a hot spot for IR detection. Even if the IR system is capable of locating a target, the target's actual identity still can be disguised. Avoid building unnecessary fires. Use vehicle heaters only when necessary. BDU dyes, LCSS, IR-defeating obscurants, and chemical-resistant camouflage paints help break up IR signatures but will not defeat IR sensors.

d. *UV Sensors.* UV sensors are a significant threat in snow-covered areas. Winter camouflage paint patterns, the arctic LCSS, and terrain masking are the critical means for defending against

these sensors; any kind of smoke will defeat UV sensors. Field-expedient measures, such as the construction of snow walls, also provide a means of defeating UV sensors.

e. *Radar.*

(1) MTI Radar.

(a) MTI radar is a threat to ground forces near the battle area. Mission dictates the appropriate defense, while techniques depend on the equipment available. Radar-reflecting metal on dismounted soldiers has been reduced. Kevlar helmets and body armor are now radar-transparent. Plastic canteens are standard issue. Velcro and buttons have replaced metal snaps on most field uniforms. A soldier wearing only the BDU cannot be detected until very close to an MTI radar.

(b) Unfortunately, soldiers still carry metal objects to accomplish their mission (such as ammunition, magazines, and weapons), and most radars can detect these items. Therefore, movement discipline is very important. Moving by covered routes (terrain masking) will prevent radar detection. Slow, deliberate movements across areas exposed to radar coverage will assist in avoiding the attention of enemy MTI radar operators.

(c) Vehicles are large radar-reflecting objects. When vehicles move, they can be detected by MTI radar from up to 20 kilometers away. A skilled MTI operator can also identify the type of vehicle. Moving by covered routes protects against MTI radar surveillance.

(2) Imaging Radar. Imaging radar is not a threat to individual soldiers. Setting vehicles behind earth, masonry walls, or dense foliage effectively screens them from imaging radar. Light foliage may provide complete visual concealment; however, light foliage is often transparent to imaging radar. The radar-scattering LCSS also provides effective camouflage. When properly installed LCSS effectively scatters the beam of imaging radars.

(3) CM and CB Radars. The radars used by Threat forces are subject to overload. They are very effective and accurate when tracking single rounds. However, they cannot accurately process data on multiple rounds (four or more) fired simultaneously. Chaff is also effective against CM and CB radars if placed near the radar.

f. *Acoustic Sensors.*

(1) Human Ear. Noise discipline will defeat detection by the human ear. Pyrotechnics or loudspeakers can screen noise, cover inherently noisy activities, and confuse interpretation of sounds.

(2) Sound-Ranging Teams. It is possible to confuse the Threat by screening flashes or sounds. Explosives or pyrotechnics, fired a few hundred meters from a battery's position within a second of firing artillery, will effectively confuse sound-ranging teams. Coordination of fire with adjacent batteries (within two seconds) can also be effective in confusing enemy sound-ranging teams.

g. **Radio Sensors.** The best way to prevent the enemy from locating radio transmitters is to minimize transmissions, protect transmissions from enemy interception, and practice good radiotelephone operator (RATELO) procedures. Methods that ensure transmissions are minimized include preplanning messages, transmitting as quickly as possible, and using alternate communication means whenever possible. Whenever possible, use low-power transmissions, terrain masking, or directional or short-range antennas to protect the enemy from intercepting radio communications. FM 24-33 provides an in-depth review of reducing the threat to friendly communications.

**3-6. Minimizing Movement.** Movement is certain to attract attention. Movement also produces a number of other signatures (such as tracks, noise, hot spots, and dust), all of which can be detected. Therefore, keep movement to a minimum. In operations that inherently involve movement (such as an offensive), plan, discipline, and manage the movement so that signatures are reduced as much as possible. Disciplined movement includes the techniques identified in Chapter 5.

**3-7. Using Decoys.** Use decoys to confuse the enemy. The goal is to divert enemy resources into reporting or engaging false targets. An enemy who has identified decoys as *real* is less inclined to search harder for a well-hidden target. FM 90-2 addresses the correct employment of decoys.

**3-8. Continuously Avoiding Detection.** Many sensors operate as well by night as during the day. Night no longer provides totally effective protection from surveillance. As passive sensors are very difficult to detect, assume they are being used at night. Do not allow antidetection efforts to lapse during the hours of darkness. For example, conceal spoil while excavating a fighting position, even at night. Smoke also blocks night-vision devices.

**3-9. Avoiding Operational Patterns.** An enemy can often detect and identify different types of units or operations by analyzing the patterns of signatures that accompany its activities. For instance, an offensive operation is usually preceded by the forward movement of engineer obstacle-breaching assets; petroleum oils and lubricants (POL); and ammunition. Movements are very difficult to conceal; therefore, an alternative is to modify the pattern of resupply. The repetitive use of identical camouflage or decoy techniques will eventually be recognized by the enemy.

## Section II. Detection Factors

**3-10. Factors.** To camouflage effectively, you must constantly consider the Threat's viewpoint. Prevent patterns in antidetection measures by applying the eight recognition factors to your tactical situation. Determine which signatures the enemy's sensors are capable of detecting. The eight recognition factors are characteristics that make an object contrast with its background. These recognition factors are--

- Shape.
- Shadow.
- Color.
- Texture.
- Patterns.

- Movement.
- Temperature.
- Radar return.

**3-11. Shape.** The natural background is random, while military equipment has regular features with hard, angular lines. Even a camouflage net, when erected, takes on a shape with smooth curves between support points. The Threat can easily see objects if they are silhouetted, but they can also see objects against any background unless you take care to conceal them.

**3-12. Shadow.** Shadow can be divided into two types: cast and contained. Cast shadow is the type we are most familiar with and is the silhouette of an object projected against its background. Contained shadows are the dark pools of shadow formed in permanently shaded areas. Examples of contained shadows are those under the track guards of armored fighting vehicles (AFVs), inside a slit trench, inside an open cupola, or under a vehicle. These shadows show up much darker than their surroundings and are easily detected by the enemy.

**3-13. Color.** Color contrast can be important at close ranges; however, the longer the range the less important color becomes. At very long ranges, all colors tend to merge into an even tone. Additionally, in poor light the human eye cannot discriminate color.

**3-14. Texture.** A rough surface will appear darker than a smooth surface, even if both surfaces are the same color. An important field application of texture is vehicle tracks. Vehicle tracks change the texture of the ground, leaving track marks clearly visible. In extreme cases the texture of glass or other very smooth surfaces will cause a shine that acts as a beacon. Under normal circumstances, very smooth surfaces stand out from the background. Therefore, eliminating shine must take a high priority in camouflage.

### **3-15. Patterns.**

a. *Equipment Patterns.* Equipment patterns often differ considerably from background patterns. The critical relationships that determine contrast between a piece of equipment and its background are the distance between the observer and the equipment and the distance between the equipment and its background. Since these distances usually vary, it is very difficult to paint equipment with a pattern that will always allow a piece of equipment to blend with its background.

b. *Terrain Patterns.* The overall terrain pattern and the signatures produced by military activity on the terrain are important recognition factors. If a unit's presence is to remain unnoticed, the unit must match the signatures produced by stationary equipment, trucks, and other activities with the terrain pattern.

**3-16. Movement.** Movement will always attract attention against a stationary background. Slow, regular movement is usually less obvious than fast or erratic movement.

**3-17. Temperature.** As Chapter 2 indicated, sophisticated IR sensors can detect differences in temperature between military equipment and surrounding vegetation and backgrounds.

**3-18. Radar Return.** Radar can detect differences in an object's ability to reflect radio waves. Since metal more completely reflects radio waves and metals are still an integral part of military activities, radar return is an important recognition factor.

### Section III. Camouflage Principles

**3-19. Site Selection.** Site selection is extremely important; by itself it can eliminate or reduce many of the recognition factors. For example, if a tank is positioned so it faces probable enemy sensor locations, the thermal signature from the hot engine compartment is minimized. If the vehicle is positioned under foliage, its exhaust will disperse and cool as it rises, again reducing the thermal signature and blending with the background. Placing equipment in defilade (dug-in) positions will prevent detection by ground-mounted radars. The following factors govern site selection:

a. *Mission.* The mission is paramount. A particular site may be excellent from a camouflage standpoint, but useful only if it permits mission accomplishment.

b. *Dispersion.* The requirement for dispersion dictates site size. A site is of limited usefulness if it will not permit enough dispersal for survivability and effective operations.

c. *Terrain Patterns.* Every type of terrain, even an apparently flat desert, has a discernible pattern. Terrain features can conceal, or at least blur, the signatures of military activity. By using terrain features, you can enhance your camouflage's effectiveness without relying on additional materials. The primary factor to consider is whether using the site will disturb the terrain pattern enough to attract the enemy's attention. The goal is not to disturb the terrain pattern at all. Any change in an existing terrain pattern will indicate the presence of activity, so minimize change to the terrain pattern. Terrain patterns have distinctive characteristics that are necessary to preserve. There are four general terrain patterns:

(1) Rural. Rural terrain has a checkerboard pattern when viewed from aircraft or using aerial photography. This is a result of the different types of crops and vegetation found on most farms.

(2) Urban. Most urban terrain is characterized by uniform rows of housing with interwoven streets and interspersed trees and shrubs.

(3) Wooded. Woodlands are characterized by natural, irregular features, unlike the geometric patterns of man-made, rural, and urban terrains.

(4) Barren. Like wooded terrain, barren terrain presents an uneven, irregular work of nature, without the defined patterns of rural and urban areas.

**3-20. Concealment.** There are four methods of concealment:

a. *Hiding.* Hiding is the complete concealment of an object by some form of screen. Examples of different ways to hide are: placing sod over mines in minefield, placing objects beneath tree

canopies, placing equipment in defilade positions, covering objects with nets, and hiding roads or obstacles with linear screens. Make every effort to hide all operations. If possible, hide operations by conditions of limited visibility or by using terrain masking.

b. *Blending*. Blending is the arrangement or application of camouflage material on, over, and around an object so that it appears to be part of the background. Blending is important when trying to defeat all sensors.

c. *Disrupting*. Breaking up an object's characteristic shape to avoid recognition because of shape, contrast, shadow, or radar or thermal signature, is considered a disruption technique.

d. *Disguising*. Disguise is the application of materials to hide the true identity of an object. The purpose of disguise is to change the appearance of an object to resemble something of lesser or greater significance. For example, a missile launcher can be disguised to resemble a cargo truck. Clever disguise can mislead the enemy about the identity, strength, and intentions of friendly forces.

**3-21. Camouflage Discipline.** Camouflage discipline is the avoidance of activity that changes an area's appearance or reveals the presence of military equipment. Camouflage discipline is a continuous necessity that applies to every soldier. If the prescribed visual and audio routines of camouflage discipline are not observed, an entire camouflage effort may fail. Vehicle tracks, spoil, and debris are the most common signs of military activity. Their presence can negate all efforts of proper placement and concealment. SOPs prescribing camouflage procedures aid in enforcing camouflage discipline. The SOP should list specific responsibilities for enforcing established camouflage measures and discipline. It should detail procedures for individual and unit conduct in operational positions, assembly areas, or in any other situation that may be appropriate to the specific unit. Appendix A provides additional guidance for developing a camouflage SOP. Camouflage discipline is a continuous requirement that calls for strong leadership which produces a disciplined camouflage consciousness throughout the entire unit.

a. *Light- and Heat-Source Discipline*. Light- and heat-source discipline, though important at all times, is crucial at night. As long as visual observation remains one of the main reconnaissance methods, concealment of light signatures will remain an important camouflage measure. Lights that are not *blacked out* at night can be observed at great distances. For example, the human eye can detect camp fires (light) from distances up to 8 kilometers and vehicle lights from up to 20 kilometers. Threat surveillance can detect heat from engines, stoves, and heaters from these distances also. Allow smoking and electric light use only under cover. When moving at night, vehicles in the forward combat area should use ground guides or black-out lights. Control the use of heat sources and, when their use is unavoidable, use terrain masking and other techniques to minimize thermal signatures from fires and stoves.

b. *Noise Discipline*. Individuals should remain conscious of actions that produce noise and take precautions to avoid or minimize such noises. For example, muffle generators with shields, terrain masking, or defilade positions.



*c. Spoil Discipline.* The prompt and complete police of debris and spoil, while necessary for sanitary reasons, is an essential camouflage measure. Proper spoil discipline removes one of the key signatures of a unit's current or past presence in an area. Usually, vehicle tracks are clearly visible from the air; therefore, track and movement discipline are essential. Use existing roads and tracks as much as possible. When new paths are used, they must fit into the existing terrain pattern. Minimize, plan, and coordinate all movement. Take full advantage of cover and dead ground.

---

## PART TWO

# CAMOUFLAGE DURING TACTICAL OPERATIONS

### Chapter 4

## Camouflage Techniques

*Camouflage is an integral part of tactical operations. It is integrated into METT-T analyses at all echelons through terrain and weather analysis. The IPB process provides a detailed and documented terrain and weather analysis. Camouflage is a primary consideration when planning operations security and deception measures. The skillful use of all camouflage techniques is necessary if the unit is to conceal itself and survive.*

**4-1. Natural Conditions.** The proper use of terrain and weather is a first priority when employing camouflage. Concealment provided by the terrain and by conditions of limited visibility is often enough to conceal units. The maximum use of natural conditions will minimize the amount of resources and time devoted to camouflage. The concealment properties of terrain are determined by the number and quality of natural screens, as well as terrain patterns.

a. *Terrain.*

(1) **Forests.** Forests generally provide the best type of natural screen against optical reconnaissance, especially if the crowns of the trees are wide enough to prevent aerial observation of the ground. Forests with undergrowth also hinder ground observation. Deciduous (leafing) forests are not effective during the months when trees are bare, while coniferous (evergreen) forests preserve their concealment properties all year round. Move along roads and gaps covered by tree crowns. Use shade to conceal vehicles, equipment and personnel from aerial observation. In the northern (southern) hemisphere, the northern (southern) edge of forests are shaded most of the time.

(2) **Open Terrain.** Limited visibility is an especially important concealment tool when conducting operations over open terrain. The Threat, however, will conduct reconnaissance at these times with night-surveillance devices, radars, IR sensors, and terrain illumination. When using conditions of limited visibility to cross open terrain, supplement your concealment with artificial materials and smoke.

(3) **Dead Space.** Units should never locate or move along the topographic crests of hills or along other locations where they are silhouetted against the sky. Instead, reverse slopes of hills, ravines, embankments, and other terrain features are effective screens for avoiding detection by ground-mounted sensors. The IPB concealment, terrain-factor overlays should identify areas of dead space. See FM 21-26 for more details. If the overlays are not available, use the line-of-sight

method to identify areas of dead space. Dead space for radar sensors is smaller than that of optical sensors. Determine the size of these areas by reducing the rear boundary of visual dead space by 25 percent.

*b. Limited Visibility.*

(1) Weather. Conditions of limited visibility (fog, rain, and snow) hamper reconnaissance by optical sensors. Dense fog is impervious to both visible and NIR radiation, making many Threat night-surveillance devices unusable. Dense fog and clouds are impenetrable to thermal sensors (IR). Rain, snow, and other types of precipitation hinder optical and radar sensors.

(2) Smoke Operations. Smoke is an effective tool for enhancing other camouflage techniques. Smoke and obscurants can change the dynamics of the battle by blocking or degrading the spectral bands used by Threat target-acquisition and weapons systems. Near- and midterm developments of smoke and obscurants will include the capability to degrade nonvisual sensor systems. FM 3-50 contains detailed information on planning smoke operations.

*c. Data Sources.* Commanders must be capable of evaluating natural conditions in their area to effectively direct unit concealment. They must know the terrain and weather conditions prior to mission execution. In addition to IPB terrain-factor overlays, weather reports, and topographic maps, use aerial photographs, reconnaissance, and information gathered from local inhabitants to determine the terrain's concealing properties.

**4-2. Camouflage Materials.** While the use of natural conditions is the first priority of camouflage, the use of artificial materials enhance camouflage efforts. Artificial materials available include pattern-painted equipment, LCSS, vegetation, expedient paints, and decoys.

*a. Pattern Paints for Equipment.* Pattern-painted vehicles blend well with the background and can hide from optical sensors better than those painted a solid, subdued color. Pattern-painted equipment enhances antidetection by reducing shape, shadow, and color signatures. Improved camouflage paints resist chemical agents and protect against detection by NIR sensors. The paint helps avoid detection by matching the reflectance levels of vegetation in the visible and NIR portions of the EM spectrum. The result is a vehicle or item of equipment that blends into the vegetation when viewed by optical or NIR sensors. While a patterned paint scheme is most effective in static positions, it also tends to disrupt aiming points on a moving target.

*b. LCSS.*

(1) Capabilities. The LCSS not only reduces a vehicle's visibility; it defeats radar sensors. Stainless steel fibers in the plastic garnish material absorb some of the radar signal and reflect most of the remaining signal in all directions. The result is a small percentage of signal return to the radar for detection. The radar-scattering capabilities of the LCSS are effective only if there is at least 2 feet of space between the object to be camouflaged and the LCSS and the LCSS completely covers the object. Since a radar-scattering net placed over a radar set would make the set useless, the LCSS also comes in a radar-transparent model.

(2) Characteristics. There are three different LCSS color patterns: desert, woodland, and arctic. Both sides of each type of LCSS have slightly different patterns to allow for seasonal variations. The LCSS employs modular construction, allowing the capability to cover various sizes of equipment. Appendix B discusses the required components and instructions for assembling LCSS structures for different sizes of equipment.

c. *Vegetation.* Use branches and vines as temporary concealment for vehicles, equipment, and personnel. Attach vegetation to equipment, using camouflage foliage brackets or spring clips. Use cut foliage to complete or supplement natural, growing vegetation. Also use cut foliage to augment other artificial camouflage materials, such as placing branches on LCSS to break up its outline. Take care to place green vegetation correctly. The underside of leaves present a lighter tone in photographs. Replace cut foliage often because it wilts and changes color rapidly. Table 4-1 lists the approximate periods that different types of foliage can be expected to retain their camouflage values. When selecting foliage for camouflage, consider the following:

- Coniferous vegetation, if available, is preferred because it will not wilt as rapidly as deciduous vegetation.
- Foliage cut during periods of high humidity (at night, during a rainstorm, or when there is fog or a heavy dew) will have a higher moisture content.
- Foliage with leaves that feel tough to the fingers and branches with large leaves are preferred as they stay fresher longer.
- Branches that grow in direct sunlight are tougher and will stay fresher longer.
- Branches that are free of disease and insects will not wilt as rapidly.

(1) *Living Vegetation.* Living vegetation is easily obtainable, and its color and texture make it a good blending agent. However, the foliage requires a large amount of maintenance to keep the camouflage material fresh and in good condition. If branches are not placed in their proper growing position, they may give away your position to enemy observers. As cutting large amounts of branches can also reveal the site, all cutting should be done away from the camouflaged area. As the branches wilt, they lose both their color and NIR-blending properties.

(2) *Dead Vegetation.* Use dead vegetation, such as dried grass, hay, straw, or branches, for texturing. While dead vegetation is usually readily available and requires little maintenance, it is flammable and offers little camouflage against NIR sensors.

d. *Expedient Paints.* Use earth, sand, and gravel to change or add color, to provide a coarse texture, to simulate cleared spots or blast marks, and to create shapes and shadows. Mud makes an excellent field expedient for toning down bright and shiny objects (for example, glass, bayonets, and watches). Add clay (in mud form) of various colors to crankcase oil to produce a field-expedient paint. FM 5-34 provides instructions on how to mix expedient paints.

**4-3. Camouflage Discipline.** Camouflage discipline, a principle of camouflage, denies the enemy indications of a unit's location or activities by avoiding any disturbance in the area's appearance. To help maintain unit viability, the unit must integrate all available camouflage means into a

cohesive plan. Camouflage discipline involves light, heat, noise, spoil, trash, and movement discipline. Successful camouflage discipline depends largely on the actions of individual soldiers. Many of these actions make the soldier's life more difficult, and a failure by only one soldier can defeat an entire unit's camouflage efforts.

Table 4-1. Retention Values of Cut Foliage

<b>Species</b>	<b>Hours in Sunlight Without Water</b>	<b>Days in Sunlight With Water</b>
AdlerApple	3 to 4	1 to 2
Apple	8 or more	6 or more
Ash	2 or less	Less than 1
Aspen (Poplar)	2 or less	Less than 1
Austrailian Pine***	24 to 72	8 to 16
Basswood (Linden)	5 to 7	3 to 5
Beech	5 to 7	3 to 5
Birch	3 to 4	1 to 2
Black Locust	2 or less	Less than 1
Blueberry*	8 or more	6 or more
Butternut*	2 or less	Less than 1
Cherry	3 to 4	1 to 2
Chestnut	5 to 7	3 to 5
Coconut Palm Leaves***	72 to 144	4 to 8
Elderberry	2 or less	Less than 1
Elm	3 to 4	Less than 1
Fishtail Palm Leaves***	72 to 144	4 to 8
Hawthorne	8 or more	6 or more
Hickory*	3 to 4	1 to 2
Lilac	5 to 7	6 or more
Mangrove***	12 to 24	0.5 to 1
Maple	8 or more	1 to 2
Palomaria***	72 to 144	8 to 16
Privet**	8 or more	6 or more
Screw Pine***	72 to 144	3 to 6
Sumac*	2 or less	3 to 5
Sycamore (Plane)	3 to 4	1 to 2
Walnut	2 or less	Less than 1
White Oak group	5 to 7	3 to 5
Willow	2 or less	Less than 1
Yellow Poplar (Tulip)	3 to 4	1 to 2
*North America only **Europe only *** Tropics only		

## Chapter 5

# Offensive Operations

*Camouflage measures implemented during an offensive prevent the enemy from discovering friendly units' locations, actions, and intentions. Successful camouflage contributes to achieving surprise and reduces subsequent personnel and equipment losses.*

### 5-1. Camouflage During Offensive Preparations.

a. *Considerations.* The main camouflage concern in preparing for an offensive is to mask unit deployment. While camouflage is the primary means of masking these activities, deception operations frequently achieve these goals.

b. *Signatures.* Offensive operations create signatures that the enemy can detect. Further analysis of these signatures may alert the enemy to our offensive operations (such as planning and location). Commanders at all levels should be swam of the signatures their operations emit and strive to conceal them from enemy surveillance. These signatures include—

- Increased scouting and reconnaissance activity.
- Preparation of traffic routes.
- Forward movement of supplies and ammunition.
- Obstacle breaching.
- Engineer preparation and the occupation of assembly areas.
- Preparation and occupation of forward artillery positions.
- Increased radio communications.

### 5-2. Preparations.

a. *Assembly Areas.* Engineers should conduct assembly area preparations during conditions of limited visibility. They should also remove any indication (signatures) of their activities as quickly as possible.

(1) Location. Designate assembly areas on terrain with natural screens and a developed network of roads and paths. Thick forests and small towns and villages often provide the best assembly locations. In the absence of natural screens, use spotty sectors of the terrain or previously

occupied locations. Place equipment on spots matching its coloring, and take maximum advantage of artificial camouflage materials.

(2) Movement. Designate concealed routes for movement into and out of the area. Mask the noise of movement by practicing good noise discipline. For instance, the noise of armor movement can be muffled by the thunder of artillery fire, the noise of low-flying aircraft, or the transmissions of sound broadcast sets.

(3) Camouflage.

(a) Vehicles. Position vehicles to take full advantage of the terrain's natural concealment properties, and cover them with the LCSS. Apply touch-up paint and cut vegetation to vehicles to enhance camouflage at the assembly area and during battle. As assembly areas are particularly vulnerable to aerial detection, strictly enforce track and movement discipline. Take care to remove any tracks by covering or sweeping them with branches. Strictly enforce radio discipline.

(b) Personnel. While at the assembly area, personnel should apply individual camouflage. Application of stick paint and cut vegetation will enhance camouflage during all phases of the operation.

b. *Decoys*. The Threat may interpret decoy construction as efforts to reinforce defensive positions. Activities such as laying fake minefield and building bunkers and positions can conceal actual offensive preparations and give the enemy the impression that defenses are being improved. If necessary, conduct engineer preparation activities on a wide front so as not to reveal the area of the main attack.

c. *Troop and Supply Movements*. Move troops, ammunition, supplies, and engineer breaching equipment forward at night and under other conditions of limited visibility. Although the Threat's use of radar and IR aerial reconnaissance hinders concealed operations at night, darkness remains a significant concealment tool. Select routes that take full advantage of the terrain's screening properties. Commanders must understand how to combine darkness and the terrain's concealing properties to camouflage troop and supply movements.

(1) Movement Orders. When conducting a march, convoy commanders must strictly enforce blackout requirements and the order of march. Guidelines concerning lighting, march order, and other requirements are usually published in SOPs or operation orders. Required lighting conditions usually vary depending on the type of movement (convoy versus single-vehicle) and the unit's location (such as forward edge of the battle area (FEBA), division area, and corps rear area). Inspect each vehicle's blackout devices for proper operation.

(2) Speed of March. Enemy aerial reconnaissance usually focuses on open and barely passable route sectors. Therefore, when on the march, vehicles should pass these types of sectors at the highest possible speeds. If prolonged delays result from encountering an unexpected obstacle, halt



the column and disperse into the nearest natural screens. If vehicles break down during the movement, push them off the road and camouflage them.

(3) **Movement During Times of Good Visibility.** When marches must be conducted under conditions of good visibility, consider moving by infiltration (single or small groups of vehicles released at different intervals). Movement in stages, from one natural screen to the next, will further minimize possible detection. Use smoke screens at critical crossings or choke points.

(4) **Halts.** When stopping briefly, quickly disperse vehicles under tree crowns or other concealment along the sides of the road. Strictly enforce camouflage discipline. Particularly important points to avoid are glare from vehicle windshields, headlights, or reflectors and the control of troop movement on the road or in other open areas. Conduct reconnaissance to select areas for long halts. The reconnaissance party should select areas large enough to allow sufficient camouflage and dispersion. The quartering party should predetermine vehicle placement, develop a vehicle circulation plan, and guide the vehicles into suitable and concealed locations. The first priority, however, is to move vehicles off the road as quickly as possible, even at the expense of initial dispersion. Use the LCSS and natural vegetation to enhance camouflage. Carefully camouflage dug-in positions.

(5) **Traffic Control.** Traffic control personnel have a crucial role in enforcing convoy camouflage. Commanders should issue precise instructions to their traffic control personnel to stop passing vehicles and have the drivers correct the slightest violation of camouflage discipline. Convoy commanders are responsible for the convoy's camouflage discipline.

d. *Line Crossings.* Pass through friendly obstacles at night, in fog, or under other conditions of poor visibility. As these conditions will not protect against many types of Threat sensors, use smoke screens. Lay smoke on a wide front and several times before actually executing the passage of lines. Doing this will help to deceive the enemy about the time and place of attack. Camouflage lanes through obstacles from enemy view.

e. *Deception Operations.* Conduct demonstrations and feints to confuse the enemy as to the actual location of the main attack. Such deception operations will be effective only if prior reconnaissance activities were conducted on a wide front, thereby preventing the enemy from pinpointing the likely main attack area. See FM 90-2 for more detailed information about deception operations.

**5-3. Camouflage During the Battle.** When conducting battle, units should adapt to the terrain. Deploying behind natural vegetation, a terrain feature, or a man-made structure will maximize concealment from enemy observation. Make optimum use of concealed routes, hollows, gullies, and other terrain features that are dead-space areas to enemy observation and firing positions. A trade-off, however, usually exists in terms of a slower rate of movement when using these types of routes.

a. *Movement Considerations.* Movement techniques emphasizing fire and maneuver will aid in preventing enemy observation and targeting. Avoid dusty terrain, as clouds of dust will alert the

enemy to your presence. When natural cover and concealment are unavailable or impractical to use, the coordinated employment of smoke, suppressive fires, speed, and natural limited-visibility conditions will minimize exposure and avoid enemy fire sacks. However, offensive operations under these conditions present unique training and command and control challenges.

b. *Breaching Operations.* Breaching operations require the concealment of the unit conducting the breach. Use conditions of poor visibility and plan the use of smoke and suppressive fires to screen breaching operations. Deliberate river crossings present a unique challenge. Plan the coordinated use of terrain masking, smoke, decoys, and deception operations to ensure successful crossings (see FM 90-13).

## Chapter 6

### Defensive Operations

*Defensive operations require a great deal of emphasis on OPSEC. Proper OPSEC denies the Threat information about our defensive order of battle. Particularly important is the counterreconnaissance battle, during which defensive forces seek to blind the enemy by eliminating its reconnaissance forces. The winner of this preliminary battle is often the winner of the main battle. Camouflage, by virtue of its inherent role in counterreconnaissance efforts, plays an important role in both battles.*

#### Section I. Camouflage During Defensive Preparations

**6-1. Objectives.** The purpose of camouflage during defensive preparations is to mask key or sensitive activities. Successful camouflage of these activities will lead to an enemy force that is *blinded* and, therefore, more likely to attack into the strengths of our defense. These activities include—

- Location of reserve and counterattack forces.
- Preparation and trace of survivability positions and obstacles.
- Nature of any engineering work.
- Maneuver of forces.

**6-2. Signatures.** There are a number of signatures that may indicate to Threat forces that we are making defensive preparations. The Threat analyzes these signatures to determine the outline of our defensive plan. Specific signatures that could reveal our defensive plans include—

- Engineering work on survivability positions.
- Reparation of minefield and other obstacles.
- Movement of different types of combat materiel into prepared positions.
- Reparation of routes and facilities for defensive forces maneuver.
- Construction of strong points or hardened artillery positions.
- Use or patterns of smoke and obscurants.

#### **6-3. Reserve and Counterattack Forces.**

a. *Planning.* Due to the similarity of missions, the concerns for camouflaging counterattack and reserve forces are similar to those of maneuver forces engaged in offensive

operations. Chapter 5 discusses considerations concerning assembly areas, troop and supply movements, passages of lines, and deception operations. This information is also useful as a guide when planning camouflage for counterattack.

Proper planning is essential to ensure the greatest chance of avoiding Threat detection and preventing successful enemy analysis of the engineering efforts integral to defensive preparations. As engineering equipment creates significant signatures, minimize its use on any mission to a level commensurate with available labor and time resources. Disperse any engineering equipment not required at the job site. Complete as much work as possible without heavy equipment and allow heavy equipment on site only when necessary. Engineers should minimize their time on site by conducting thorough and extensive planning and preparations.

Additional signatures that should concern camouflage planners include—

- Arrival and departure of supplies, personnel, and vehicles into the unit area.
- Construction of survivability positions.
- Smoke and heat from kitchens, fires, and stoves.
- Operation of communications facilities.
- Educational and training exercises.

b. *Movement.* Reserve forces should move along preplanned, concealed routes. They should also move and occupy selected locations at night or during other conditions of limited visibility. Quarters parties should preselect individual positions and guide vehicles and personnel to assigned locations. Light, noise, and track discipline are essential, but they are the most difficult to control during this phase. The quarters party should also develop a traffic-flow plan that minimizes movement of vehicles and troops to and from the unit area. Strictly enforce the plan to minimize movement and signatures, both of which are easily detected. Arriving units should immediately begin to conceal their positions. Commanders should detail the priorities for camouflage, based on their assessment of which signatures present the greatest opportunity for Threat detection. The sections in Chapter 5 that dealt with camouflage of assembly areas and troop and supply movements also apply to reserve forces.

c. *Assembly Areas.* While assembly area camouflage actions are similar to those of counterattack and reserve force positions, the latter positions are more likely to be occupied for a longer period. Therefore, camouflage needs are more intensive and extended for counterattack and reserve forces. In fact, their camouflage operations are often indistinguishable from those of support units that routinely deploy to positions located behind the forward line of own troops (FLOT).

Reserve and counterattack forces awaiting employment should capitalize on available time to conduct small-unit, skill-maintenance education and training exercises. Ensure proper concealment of these exercises. While essential, these activities are prone to be detected by Threat sensors. Observe camouflage discipline at all times and locations.

d. *Placement and Dispersal* Site selection is crucial when concealing the engineer effort. Proper placement and dispersal of equipment and operations are essential. Use natural screens (terrain masking); however, urban areas often provide the best concealment for counterattack and reserve forces. Chapter 8 discusses placement and dispersal in more detail. When using forests as natural screens, carefully consider factors such as the height and density of the vegetation, the amount and darkness of the shadows cast by the screen, and the appropriateness of the particular screen for the season. The condition and quality of natural screens have a decisive effect on the capability to conceal units. Commanders should include the evaluation of natural screens during engineer reconnaissance missions and conduct these missions on a timely and extensive basis.

The possibility of detection increases considerably when survivability positions are prepared. Detection is made easier due to the increased size of the objects to be camouflaged, the easier detection of contrasting upturned soil, and the difficulty of camouflaging a construction operation in progress. Despite these considerations, the enhanced protection afforded by survivability positions usually dictates their use. To minimize the possibility of detection, employ a combination of natural screens and overhead nets to conceal construction sites.

**6-4. LCSS.** Use the LCSS to camouflage vehicles, tents, shelters, and equipment. Use vegetation to further distort the outline of the object, rather than completely hide it. Ensure vegetation is not removed from one location, leaving a signature for Threat detection. Gather vegetation sparingly from many nearby areas. This technique allows your immediate area to remain relatively undisturbed.

**6-5. Stoves and Fires.** Strictly control stove and fire use. Fires and stoves produce visual and thermal signatures that Threat sensors may detect. In cases where fires are necessary, permit them only during daylight hours. Place fires in dead ground or under dense foliage. Using nets and other expedient thermal screens will also serve to dissipate heat, reducing a fire's thermal signature.

**6-6. Communications.** Discipline communications to prevent Threat intelligence teams from identifying unit locations. FM 24-33 addresses techniques essential for reducing the threat to friendly communications. Use as few wire communication lines as possible, because the Threat can easily identify and trace communication lines.

**6-7. Camouflage Discipline.** Strict camouflage discipline will allow the continued concealment of a unit's position. The longer a unit stays in one location, the harder it is for the unit to maintain camouflage discipline. Extended encampments require constant command attention to camouflage discipline. Evacuation of an area also requires camouflage discipline to ensure that evidence (such as trash and vehicle tracks) is not left for enemy detection.

## Section II. Survivability Positions and Obstacles

**6-8. Description.** Survivability positions include fighting positions, protective positions (shelters), and connecting trenchworks. They are usually constructed of earth and logs but may also be composed of man-made building materials such as concrete.

**6-9. Placement.** Proper placement of positions and obstacles is the single, most important camouflage consideration. When possible, place positions and obstacles out of the direct view of

Threat forces. An excellent example of this technique is the reverse-slope defense. Place positions and obstacles at night or under other conditions of limited visibility.

**6-10. Backgrounds.** Select backgrounds that do not silhouette positions or obstacles or that provide color contrast. Use shadows to make detection by Threat forces more difficult. Place positions or obstacles under overhead cover, trees, or bushes, or any other dark area of the terrain. This technique will prevent disruption of terrain lines and possible aerial detection.

When using the terrain's natural concealment properties, avoid isolated features that usually draw the attention of enemy observers. Similarly, do not construct positions directly on or near other clearly defined terrain features (such as tree lines, hedge rows, and hill crests). Offsetting positions into tree lines or below hill crests not only avoids silhouetting against the background, but also counters enemy fire.

### **6-11. Natural Camouflage Materials.**

a. Use natural materials to supplement artificial materials. Before constructing positions or obstacles, remove and save natural materials (such as turf, leaves, and humus) for later use in restoring the terrain's natural appearance. During excavation, collect spoil in carrying devices for careful disposal. Avoid disturbing the natural look of surroundings. Use LCSS and natural vegetation to further distort the outline of a position or to hide the bottom of an open position or trench, as well as to mask spoil used as a parapet. To further avoid detection, replace natural materials regularly or as wilt and color change set in.

b. Consider the effect of back blast from rocket launchers, missile systems, and antitank weapons. Install concealed open space to the position's rear to accommodate back blast. The back-blast area should not contain material that will readily burn or generate large dust signatures.

c. Use natural materials to supplement camouflage of machine gun nests. Machine guns are priority targets, and their concealment is an essential combat task. Although camouflage is important, placement is the primary factor in concealing machine guns.

d. Place mortars in defilade positions. Proper placement, coupled with artificial and natural camouflage materials, will provide the maximum possible concealment. Also consider removable overhead concealment.

e. Use decoy positions and obstacles to draw enemy attention away from actual survivability positions and obstacle traces. Decoys serve the additional function of drawing enemy fire, allowing easier targeting of Threat weapon systems.

**6-12. Camouflage During Battle.** Camouflage during the defensive battle is essentially the same as that for the offense. While a majority of the battle is normally fought from prepared, camouflaged positions, defensive forces will still maneuver to prevent enemy breakthroughs or to counterattack.

When maneuvering, units should adapt to the terrain, making optimum use of concealed routes. Preselect and improve concealed routes to provide defensive forces a maneuver advantage. Plan smoke operations to provide additional concealment for maneuvering forces.

## Chapter 7

### Camouflage of High-Value Targets

*The intention of the Threat's doctrine is to locate, target, and destroy deep targets to degrade our defensive capabilities while adding offensive momentum to their own attacking forces. Threat commanders will focus their most sophisticated sensors in search of these types of targets. By denying us adequate command and control, combat support, or resupply operations, Threat forces hope to overwhelm our defenses at the FLOT. Therefore, proper camouflage of our commandposts, supply and water points, key fixed installations, nuclear-delivery units, and other high-value targets is absolutely essential to survival on the battlefield.*

**7-1. Command Posts (CPs).** Command and control systems provide military leaders with the capability to make timely decisions, to communicate these decisions to subordinate units, and to monitor the execution of decisions. CPs contain these systems and are organized to perform these functions for the military commander. CPs can be characterized as the nerve centers of military operations.

a. *Signatures.* Since World War II, the size and signatures of command posts have increased dramatically. Now, more than ever, CPs require excellent camouflage to survive on the battlefield. There are several signatures that the enemy can use to detect and identify CPs for destruction.

(1) **Lines of Communications.** CPs are usually located near converging lines of communications, such as road or rail junctions, and they often require new access and egress routes.

(a) **Vehicle traffic.** Concentrations of vehicles and heavy traffic, with characteristic wear and track marks, can indicate a CP's location. Also consider air traffic when evaluating detection signatures. Park vehicles and aircraft at a significant distance from CPs.

(b) **Antennae.** Antennae, with their associated electronic emissions, and an abundance of wire lines are also common to most CPs.

(c) **Security emplacements.** Security measures, such as barbed wire, barriers, security and dismount points, and other types of emplacements, can also provide an indication of CP operations. Barbed or concertina wire should follow natural terrain lines and be concealed as much as possible.



(2) Equipment. Power generators and other heat sources develop signature that are targeted by Threat surveillance. Place heat-producing equipment and other thermal sources in defilade, within structures, or under natural cover.

b. *Camouflage*. Camouflage, when used with dispersion and standardization, will improve OPSEC and increase survivability by minimizing the observable size and signatures of CPs. CP camouflage, as with that of an assembly area, requires reconnaissance, planning, discipline, and maintenance. Carefully controlled traffic plans will also decrease the possibility of disturbing natural cover and creating new, observable paths.

c. *Sites*. CP sites, while likely to be moved at least every 24 hours, are still occupied for a longer period than assembly areas. Therefore, CP placement is crucial. Consider the following:

- When placing a CP, consider the needs of supporting an extended occupation while minimizing changes to natural terrain patterns.
- Take advantage of existing lines of communications (roads, trails, streams, and so forth). Avoid sites requiring new roads or paths, but if this is unavoidable, make maximum use of natural concealment and existing terrain. The fewer new lines required, the better the CP blends, leaving natural features relatively unchanged.
- Do not locate a CP directly at a road junction. Road junctions are obvious targets for enemy sensor systems.
- If possible, locate a CP in an existing civilian structure. Doing this simplifies hiding military activity. However, if you place a CP in a building, choose a building in an area where a sufficient number of other buildings can mask its location.

d. *Radiotelephone Procedures*. By strictly complying with proper radiotelephone procedures, you will decrease the opportunities for the Threat to detect you. Consider the following:

- Place your antennae in a remote location such as in an antenna farm or in and around trees or other natural screens.
- Move your antennae as often as possible.
- Use directional antennae whenever possible. If you must use nondirectional antennae, employ proper terrain-masking techniques to defeat Threat radio direction-finding efforts.
- Maximize the use of existing telephone lines. However, remember that newly laid wire is a readily observable signature that can reveal a CP's location. Communications wire and cable should follow natural terrain lines and be concealed as much as possible.

e. *Camouflage Discipline*. After occupation of the site and erection of camouflage to supplement available natural concealment, maintain camouflage discipline. Establish and use designated foot paths to, from, and within the CP area. Security and dismount points and other individual emplacements should be well camouflaged, and the paths to CPs should be inconspicuous. Enforce proper procedures for trash and spoil disposal. Rigidly enforce light and noise discipline.

**7-2. Supply and Water Points.** Supply and water points provide logistical support, the backbone of sustained combat operations. As these targets are relatively immobile and the object of the Threat's most sophisticated sensors, camouflage is one of the few effective measures to improve their survivability.

a. *Operations.* Many of the camouflage measures associated with assembly areas and CPs also apply to supply and water points. Camouflage of the latter, however, presents additional requirements. Large amounts of equipment and supplies are brought up quickly into tactical areas and delivered to supply points located as far forward as possible. The supplies must be unloaded and concealed quickly, while supply points remain open and accessible for distribution. Under these conditions, multiple supply points are generally easier to camouflage than single, large ones. Decoy supply and water points can also confuse Threat targeting efforts.

b. *Camouflage.* Take maximum advantage of natural cover and concealment. Configure logistics layouts to conform with the local ground pattern. Creativity can play a large role in doing this. For example, in plowed fields, stacking supplies parallel to the furrows and covering them with earth-colored tarps can provide effective concealment from aerial observation. The following guidelines will enhance concealment of these operations:

- Avoid establishing regular (square or rectangular) perimeter shapes for the area.
- Select locations where concealed access and egress routes are already established and easily controlled.
- If new access roads are needed, use roads that have existing overhead concealment. Conceal access over short, open areas with overhead nets.
- Rigidly control movement into and out of the supply area.
- Mix and disperse supply point stocks to the maximum extent possible, not only to avoid a pattern of stockpile shapes but to avoid easy destruction of one entire commodity.
- Irregularly space stocks (both in length and depth) to avoid recognizable patterns. Stack supplies as low as possible to avoid shadows. If resources allow, dig supplies in.
- Cover stocks with nets and other materials that blend with the local ground pattern. Flattops (large, horizontal camouflage nets) are effective for concealing supply-point activities when resources allow their construction and supply points are not too large.

c. *Traffic Control.* Access and traffic-control plans should provide for minimal changes to the natural terrain as a result of movement into, within, and out of the area. Provide for concealment and control of vehicles waiting to draw supplies. Rigidly practice and enforce camouflage discipline. Debris control may be especially troublesome and will require constant attention.

d. *Water-Point Considerations.* Camouflage of water points includes additional considerations:

(1) *Spillage.* Minimize water spillage. Provide adequate drainage to prevent standing pools of water that can reflect light and attract attention.

(2) Equipment. Use adequate natural and artificial concealment for operating personnel, storage tanks, and specialized pumping and purification equipment. Conceal water-point equipment to eliminate shine from water. Conceal shine by placing canvas covers on tanks, using LCSS, and placing foliage on or around water tanks. Use the same methods to distort the characteristic shape of these tanks.

(3) Scheduling. Enhance camouflage discipline at water points by setting and strictly enforcing a supply schedule for units. The lack or violation of such a schedule will produce a concentration of waiting vehicles which is difficult to conceal.

**7-3. Fixed Installations.**

a. *Concept.* Fixed installations, such as airfields and other lines-of-communication facilities, provide scarce, nearly implacable, functional support to ground maneuver forces. The primary threat to these facilities is from fighter-bombers and attack helicopters, both of which approach targets at low altitudes and high speeds. This method of attack creates unique target-acquisition problems for the pilot due to the short time the pilot has to locate, identify, and lock onto a target (Figures 7-1 and 7-2). Proper camouflage can easily magnify the pilots' difficulties.

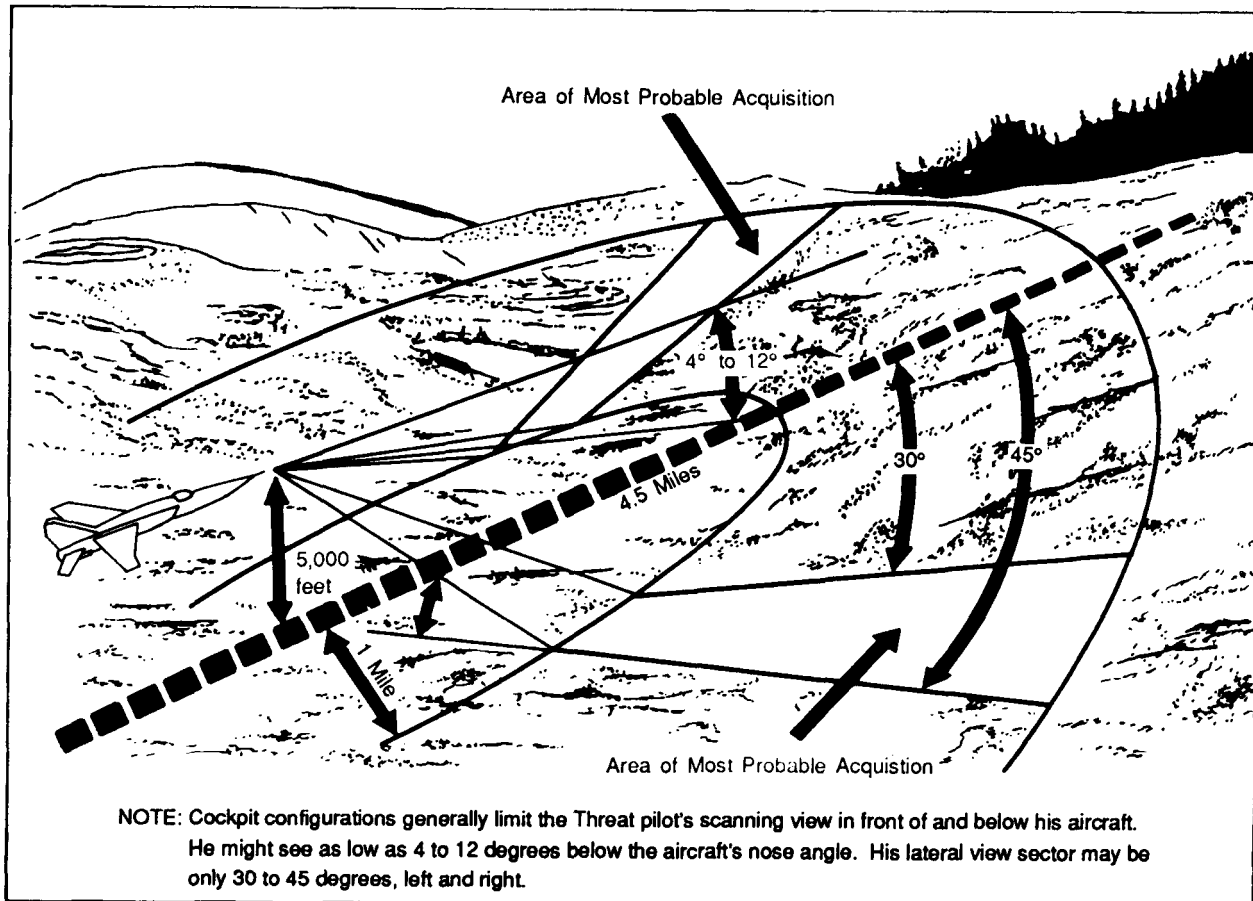


Figure 7-1. Threat High-Performance Aircraft Visibility

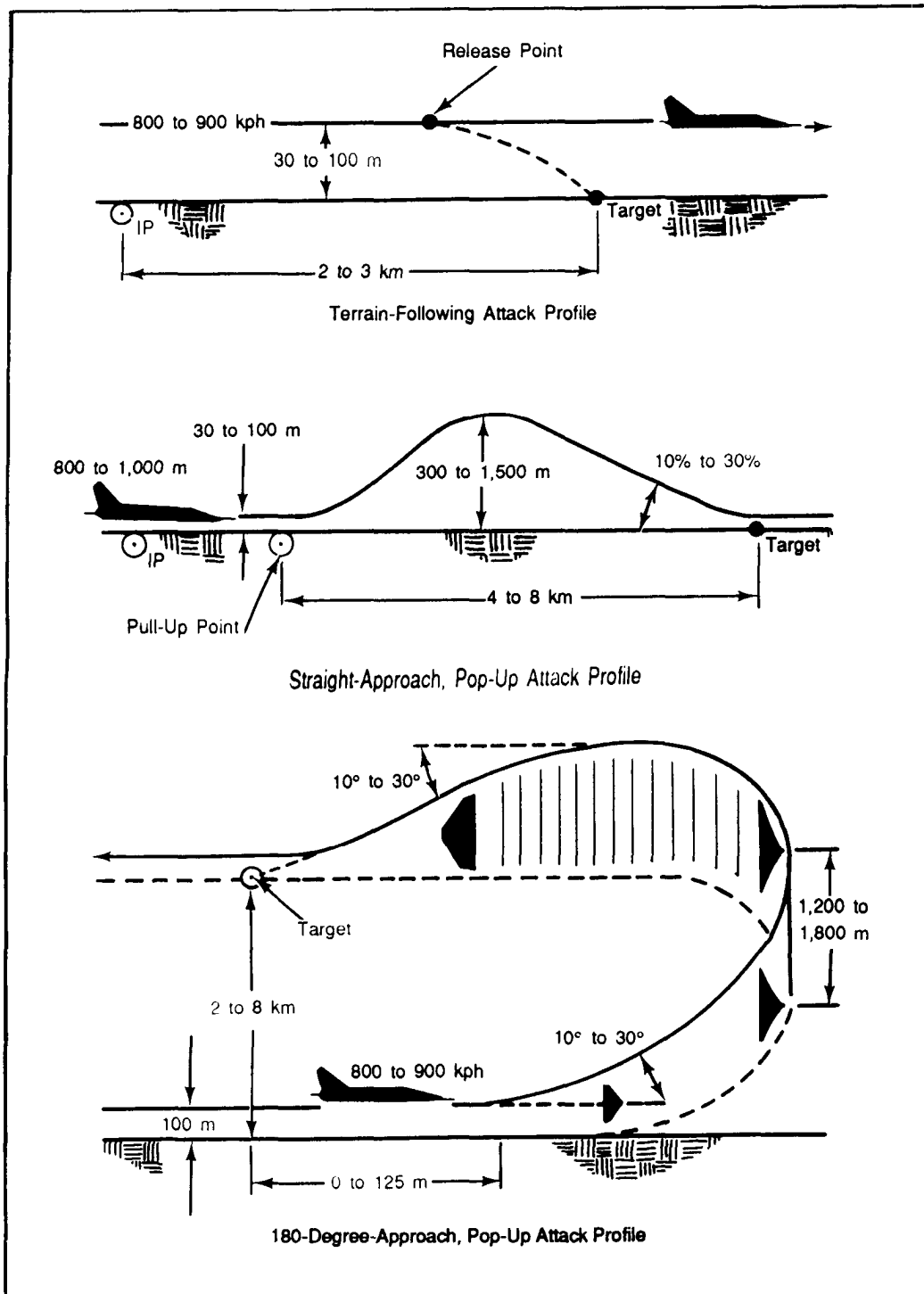


Figure 7-2. Typical Aerial Attack Profiles Against Fixed Facilities

The location and configuration of most fixed installations are well-known. Camouflage against sophisticated Threat sensor systems, except in special cases, is not cost effective. Furthermore, the cost of completely camouflaging many facilities is prohibitive. Camouflage efforts, therefore, should focus on the multispectral defeat of the attacking aircraft's target acquisition process. Camouflage efforts should take advantage of local terrain features and the poor field of vision and short time available to attacking aircraft pilots.

b. *Camouflage Plans.* There is no single solution for enhancing fixed-installation survivability using camouflage technology. The characteristics of most facilities are unique, requiring distinctly different camouflage techniques. Accordingly, every fixed-installation commander should develop a unique camouflage plan based on a thorough study of the factors affecting a Threat aircraft's ability to distinguish key targets.

(1) *Objective.* The objective of the camouflage plan is to produce the desired level of survivability within the limits of available resources. The design procedure must systematically determine what is conspicuous about a given site, why it is conspicuous, and how to best camouflage it. The ultimate goal is to decrease the effectiveness of enemy firepower by making installation location and identification and critical target acquisition more difficult to accomplish.

Minimum camouflage efforts may include the concealment of orientation cues or reference points that assist the attacker in finding the installation. The next level of effort may involve the camouflage treatment of large or conspicuous features (airfield runways or the geometric shapes of weapon storage sites) that allow the attacker to orient himself relative to the facility. Often other critical targets within the installation may be quite conspicuous, requiring additional camouflage to conceal them. Often, decoys (reference points or critical targets) may be sufficient to confuse and defeat the attacker's target-acquisition process.

(2) *Planning Approach.* Use the following eight-step approach to develop a camouflage plan that meets the installation's needs.

(a) *Identify the threat.* Initially, identify the chief Threat sensors, aircraft, weapon systems, and the most likely directions of attack.

(b) *Establish goals.* Establish specific camouflage goals for the installation. Base these goals on the Threat assessment, the impact the goals will have on operations, and the cost effectiveness of achieving the goals. This step is iterative, requiring reconsideration throughout the planning process.

(c) *Identify critical facilities.* Identify the most critical facilities on the installation. Include facilities that are critical from an operational standpoint as well as those that may provide reference points for an attack on the more lucrative targets.

(d) *Evaluate facilities.* Once you have identified the critical facilities, focus your efforts on identifying what facility features make them conspicuous to attacking aircraft. This assessment

must consider multispectral (visual, thermal, NIR, and radar) signatures. The eight recognition factors (Chapter 3) are an excellent framework within which to conduct this assessment. Include a review of area maps, site plans, and photographs, as well as an aerial survey of the installation, its surroundings, and probable attack avenues of approach.

(e) Quantify signatures. Relatively quantify the multispectral signatures emitted by installation facilities. Base signature quantity on actual surveys of critical facilities, using the array of possible Threat sensors. The goal is to develop a priority for signatures to be reduced and to determine how much each signature must be reduced.

(f) Select materials and techniques. Based on the previous steps, select the suitable materials and techniques that best reduce the facilities' signatures, while meeting the plan's camouflage goals. Table 7-1 contains a list of generic camouflage technologies that apply to fixed installations. As there is no *camouflage kit* available for fixed facilities, select techniques and materials based on what fulfills each installation's needs.

(g) Organize the plan. At this point, develop a total installation camouflage plan. Since all facilities can be characterized by two dominant features (traffic surfaces and above-ground structures), group specific camouflage measures accordingly. Consider both temporary (removable) and permanent measures. Table 7-2 groups camouflage measures according to these categories. Whichever measures you choose, avoid repetitive solutions that may be recognized as a pattern. The previous identification of installation camouflage goals, critical facilities, signature-reduction priorities, and available camouflage measures should provide the framework for the completion of this step.

(h) Implement the plan. The last step is implementation. If possible, deploy permanent measures during normal maintenance schedules. (For example, substitute special thermal coatings for normal paints.) Store temporary (removable) materials inconspicuously. Conduct deployment training for these materials, but on a schedule that will deny enemy intelligence teams the opportunity to identify the measures or develop methods to defeat the camouflage.

(3) Limitations. While all the measures and techniques described above are designed to enhance fixed-installation survivability, they have practical limitations. For example, attacking pilots will still be able to use natural cues (mountains and rivers) and some man-made cues (such as towers and expressways). The physical size of the installation will also be a limiting factor, especially if there are too many critical facilities or cues completely conceal. Despite these limitations, carefully developed and implemented camouflage plans can significantly increase fixed-installation survivability against airborne threats.

**7-4. Nuclear-Delivery Units.** Nuclear weapons retain their deterrent capabilities only as long as they cannot be targeted and destroyed. Therefore, the survivability of the tactical nuclear force is a national priority.

a. *Mobility and Camouflage.* The primary means available for enhancing the survivability of tactical nuclear-delivery units are mobility and camouflage. The ability of these units to rapidly

deploy and continuously conduct mobile operations, while crucial to their survivability, must be supplemented by a comprehensive camouflage program.

b. *Built-In Capabilities.* Camouflage should be built into systems to the maximum extent possible. Supplemental camouflage will also be needed. The same camouflage principles and rules for avoiding detection still apply, as do the considerations regarding the eight recognition factors. The basic camouflage techniques of placement, movement, decoys, and smoke and obscurants are also valid.

c. *Critical Nature.* Camouflaging a nuclear-delivery unit is similar to camouflaging any combat unit. The main difference is that, due to the high value and scarcity of these assets, a camouflage mistake is more likely to spell disaster for the nuclear unit. For these reasons, constant and intense command attention is required to ensure there are no camouflage lapses.

Table 7-1. Generic Camouflage Technology

Camouflage Objective	Optical Systems	Thermal Systems	Electronic Systems
<b>Hide</b>	Earth cover Earth embankments Vegetation LCSS Screens Smoke	Earth cover Earth embankments Vegetation LCSS Screens Smoke	Chaff Corner reflectors Earth cover Earth embankments Vegetation Nets RAM LCSS
<b>Blend</b>	Paint Foam Lights Vegetation LCSS Textured mats	Thermal paint Foam Air conditioning Vegetation LCSS Textured mats Water Insulation	Vegetation LCSS RAM Reshaping Textured mats
<b>Disguise</b>	Reshaping Paint	Reshaping Paint	Corner reflectors
<b>Decoy</b>	Lights Pneumatic or rigid structures Smoke	Flares Air conditioning Smoke	Corner reflectors Signal generators
<b>Distract</b>	Pyrotechnics Smudge post Balloons Strobe lights* Tracer simulators* Smoke**	Rocket flares Balloons Smoke**	Chaff
*Active **Active or Passive			

Table 7-2. Fixed-facility camouflage methods and materials

Feature	Removable Solutions	Permanent Solutions
<b>Traffic Surfaces</b>	Paints and coatings Water Liquid foam LCSS and carpets Corner reflectors Decoys Smoke and obscurants	Paints and coatings Reforestation Paving blocks Irregular patterns
<b>Above-Ground Structures</b>	Paints and coatings Water LCSS Corner reflectors Visual decoys Smoke and obscurants Lights	Paints and coatings Reforestation Earthworks Reshaping Insulation New construction guidelines



## Chapter 8

# Camouflage in Special Environments

*The fundamentals of camouflage do not change between environments. The eight rules for avoiding detection, the eight recognition factors, and the three camouflage principles (preventing detection, improving survivability, and improving deception capabilities) still apply. However, the results of their application do change. Different environments require thoughtful, creative, and unique camouflage techniques. The following is a discussion of different camouflage techniques that have proven effective in three special environments: desert, snow-covered, and urban terrain.*

**8-1. Desert.** The color of desert terrain varies from pink to blue, depending on the minerals in the soil. No color or combination of colors will match all deserts. Patches of uniform color in the desert are usually 10 times larger than those in wooded areas. These conditions have led to the development of a neutral, monotone tan as the best desert camouflage paint color.

a. *Topography.* Although desert terrain may appear featureless, it is not completely flat. In many respects desert terrain resembles unplowed fields; barren, rocky areas; grasslands; and steppes. The challenges and effective techniques presented by these different terrains are similar.

b. *Shadows.* In any terrain, the lower the object, the smaller the shadow. The smaller the shadow, the easier it is to conceal the object from aerial observation. Shadows cast by folds of the ground are effective as camouflage when supplemented by artificial materials. The proper draping of camouflage nets will further reduce shadows. The best solution in desert terrain is to dig in and use overhead concealment or cover.

c. *Placement.* Proper placement and shadow disruption remain effective techniques. Place objects in gullies, washes, wadies, and ravines to reduce their shadows and silhouettes, as well as to take advantage of terrain masking. More dispersion is necessary in desert terrain than in wooded areas. Move objects as the sun changes its position to keep equipment in the shadows.

d. *Terrain Mottling.* When the ground offers little opportunity for concealment, use terrain mottling. This technique involves scarring the earth with bulldozers, thereby creating darker areas on which to place equipment so it blends better with the background. Ensure the mottled areas are irregularly shaped and at least twice the size of the object to be concealed. Place the object off center in the mottled area and drape it with camouflage nets. When employing the scarring

technique, dig two to three times as many scars as pieces of equipment to be concealed. Doing this will prevent the mere presence of mottled areas giving away a unit's location.

e. *Camouflage and Movement Discipline.* Camouflage and movement discipline are especially important in the desert. Vehicle movement produces dust, diesel plumes, and track marks, all of which are easy to detect in a desert environment. When movement is necessary, move along the shortest route and, if possible, on the hardest ground. Shine is a particularly acute problem remove all reflective surfaces or cover them with burlap. Use matte camouflage paint or expedient paints (grease mixed with sand) to dull the gloss of a vehicle's finish. Shade optical devices (such as binoculars and gun sights) when using them.

f. *Noise and Light Discipline.* Noise and light discipline are particularly important in desert terrain, since sound and light can be detected at greater distances on clear desert nights. The techniques for reducing these signatures remain the same as for other environments. Keep in mind that thermal sensors, while not as effective during the day, have an ideal operating environment during cold desert nights. A technique to confuse enemy acoustical surveillance efforts is to start all vehicle and equipment engines simultaneously.

## **8-2. Snow-Covered Areas.**

a. *Paint.* When the prevalent environment color is white, commanders should direct a change to equipment camouflage that blends appropriately with the environment. Applying white paint or whitewashing over the permanent camouflage paint pattern is effective. The amount of painting, however, should be contingent on the percentage of snow coverage on the ground. As long as snow covers less than 15 percent of the background color, make no changes to the camouflage paint pattern. When there is 15 to 85 percent snow coverage, substitute white for green in the camouflage paint pattern. In terrain with more than 85 percent snow coverage, paint vehicles and equipment solid white.

b. *Placement.* A blanket of snow often will eliminate much of the ground pattern, causing natural textures and colors to disappear. Blending under these conditions will become difficult. Snow-covered terrain, however, will rarely become completely white, so take advantage of the dark features of the landscape. Site equipment in roadways, streambeds, trees, bushes, shadows, and ground folds. The colors of uniforms and personal equipment will contrast with the snow background, necessitating camouflage to reduce these easily recognized signatures.

c. *Movement.* Concealing tracks will be a significant problem, making movement discipline an absolute requirement. When moving, follow windswept drift lines—these features cast shadows—as much as possible. Vehicle drivers should avoid sharp turns and follow existing track marks as much as possible. Obliterate short lengths of track marks by trampling them with snowshoes.

d. *Thermal Signatures.* Snow-covered environments provide excellent conditions for Threat thermal and ultraviolet sensors. Terrain masking is the best solution to counter both types of sensors.

Use arctic LCSS and winter camouflage paint to provide ultraviolet blending. Use smoke to create a near-whiteout condition.

**8-3. Urban Terrain.** Urbanization is reducing the amount of open, natural terrain throughout the world. Therefore, modern military units must be able to apply effective urban camouflage. Many of the camouflage techniques used in natural terrain are effective in urban areas. The urban environment, however, presents unique camouflage opportunities.

a. *Planning.* Planning for operations in urban areas presents unique difficulties. Tactical maps do not show man-made features in enough detail to support tactical operations. Although these maps show details of adjacent terrain, you must supplement them with aerial photographs and local city maps. Local government and military organizations are key sources of information that can support tactical (and camouflage) operations. Key examples of the type of information they may provide are: diagrams of underground facilities, large scale city maps, and civil-defense or air-raid shelter locations.

b. *Site Selection.* The physical characteristics of urban areas enhance camouflage efforts. It is difficult for Threat surveillance to detect emplacements in urban terrain, making urban terrain an excellent location for concealing CPs, reserves, combat service support complexes, or combat forces. The physical structure of dense urban areas reduces the effectiveness of most modern sensors. Therefore, visual camouflage is the most important consideration.

(1) *Terrain Patterns.* The regular pattern of terrain, the diverse colors and contrast, and the large, enclosed structures offer enhanced concealment opportunities. Established, hardened road surfaces effectively mask vehicle tracks. Underground structures (sewers, subways, and so forth) are excellent means of concealing movement and high-value targets. Depending on the nature of the operation, numerous civilian personnel and vehicles may be present, confounding the Threat's ability to distinguish between military targets and civilian population.

(2) *Man-Made Structures.* Man-made structures provide symmetrical shapes that, when augmented by artificial means, provide ready-made camouflage. The camouflage of fighting positions will be especially important, given the reduced identification and engagement ranges (100 meters or less) typical of urban fighting. Limit or conceal movement and shine. These signatures provide the best opportunity for Threat surveillance to be successful in urban terrain. Careful placement of equipment and fighting positions remains important, not only to provide visual camouflage, but to avoid detection by contrast (thermal sensors detecting personnel and equipment silhouetted against colder buildings or other large, flat surfaces).

c. *Establishing Fighting Positions.* The fundamental rule is to maintain the natural look of the area as much as possible. Buildings with large, thick walls and few narrow windows provide the best concealment. When selecting a position inside a building, avoid the lighted areas around windows. Soldiers should always stand in shadows when observing or firing their weapons through windows. Select positions with covered and concealed access and egress routes (breaches in buildings, underground systems, or trenches). Since there should be plenty of opportunities, develop decoy positions to enhance camouflage operations.

d. *Placing Vehicles.* If possible, hide vehicles in large structures. Use local materials to help blend vehicles with the environment. Paint vehicles and equipment a solid, dull, dark color. If this is not possible, use expedient paints to subdue the lighter, sand-colored portions of standard camouflage paint patterns. Use shadows when placing vehicles outdoors. When moving, screen vehicles with smoke or take advantage of conditions of limited visibility.

---

## Appendix A

### Guidelines for Standing Operating Procedures

**A-1. Purpose.** Field SOPs are critical to success on the battlefield. All commanders should establish camouflage guidelines in their field SOPs and ensure their soldiers are familiar with them. The objective is to cut the time required to perform routine tasks. Achieve these ends by defining responsibilities, identifying expected tasks, and providing supervisors with a memory aid when planning or inspecting. SOPs, coupled with battle drills (Appendix B), provide units with guidance on how to execute anticipated battlefield tasks. Camouflage is a task that should be routine for all units. A comprehensive camouflage SOP that is faithfully executed will enhance the unit's ability to survive and assist soldiers to continuously employ proper camouflage measures.

**A-2. Content.** The SOP should review the fundamentals of camouflage and establish rules of camouflage discipline for the unit. Memory aids for supervisors should include an inspection checklist (see the sample checklist at the end of this appendix) and a chart of Threat sensor systems with possible countermeasures. Establish camouflage discipline rules to provide uniformity among all subunits. The SOP should also address different camouflage postures. Establish blackout, quartering-party, unit-movement, and deployment-area procedures in the SOP. Then develop appropriate camouflage postures in operation orders for different missions.

#### **A-3. Small-Unit Commander's Responsibilities.**

a. *Uniforms.* The commander must ensure each soldier has the required quantities of serviceable BDUs and that these uniforms are properly maintained to protect the BDU's infrared-screening properties.

b. *Camouflage Materials.* Based on unit requirements, supply personnel should forecast, request, and store adequate quantities of expendable camouflage supplies (such as paint, makeup, and repair kits).

c. *LCSS.* Commanders should also ensure authorized quantities of camouflage screens and support systems are on hand and continually maintained in a clean and serviceable condition. These systems should include repair kits or parts.

**A-4. Fratricide.** Since warfare often causes losses resulting from erroneously conducted operations against friendly troops, commanders should ensure this concept is incorporated into the unit's field SOPs. The commander should consider ways for friendly units to identify each other on the battlefield, as well as allied units, and incorporate these methods into the unit's field SOPs. Fratricide compels commanders to consider the effect camouflage and deception operations will have on the necessity of being recognized by friendly troops.

## Camouflage Inspection Checklist

### 1. Command Emphasis.

- a. Commander inspects frequently for camouflage deficiencies.
- b. Commander conducts follow-up inspection of deficiencies.
- c. Commander integrates camouflage into all training exercises.
- d. Unit maintains an adequate camouflage SOP is adequate.
- e. Unit follows SOP.

### 2. Discipline.

- a. *Unit*—
  - (1) Observes noise discipline at all times.
  - (2) Observes light discipline (no smoking, no fires and lights) at all times.
  - (3) Conceals all highly visible equipment.
  - (4) Covers all shiny surfaces.
  - (5) Keeps exposed activity to a minimum.
  - (6) Properly uses cut vegetation.
  - (7) Properly uses and conceals dismount points.
- b. *Soldiers*—
  - (1) Wear the correct uniform
  - (2) Control litter and spoil.

### 3. Techniques. The unit properly—

- a. Places and disperses vehicles and equipment.
- b. Disperses the CP.
- c. Uses LCSS.
- d. Uses shadows.
- e. Minimizes movement.
- f. Hides operations and equipment.
- g. Blends operations and equipment with backgrounds.
- h. Uses pattern-painting techniques.
- i. Uses decoys.

- 
- j. Integrates smoke operations.
  - k. Practices individual camouflage.
    - (1) Helmets.
    - (2) Face paint.
    - (3) Weapons.
    - (4) Other equipment.
  - l. Uses camouflage on fighting positions.
    - (1) Silhouette with background.
    - (2) Spoil control.
    - (3) Regular or geometric shapes and layouts.
    - (4) Overhead concealment.
    - (5) Dust control.
  - m. Camouflages vehicles.
    - (1) Track marks.
    - (2) Shine on vehicles and equipment.
    - (3) Shadows.
    - (4) LCSS.
    - (5) Pattern paint.
  - n. Camouflages artillery positions.
    - (1) Dispersion.
    - (2) Concealment (including supply routes).
    - (3) Litter and spoil control.
    - (4) LCSS.
    - (5) Ammunition storage and concealment.
  - o. Camouflages bivouac areas.
    - (1) Planning facilitates mission, access and egress, and concealment.
    - (2) Guideposts are marked route junctions.
    - (3) Turn-ins are not widened by improper use.
    - (4) Dismount, mess, and maintenance areas are dispersed.

- (5) CP is dispersed.
- (6) Camouflage is maintained.
  - (a) The camouflage is frequently inspected.
  - (b) Litter and garbage are controlled.
  - (c) Blackout procedures are observed.
- (7) Evacuation procedures are observed.
  - (a) Area is properly policed.
  - (b) Tracks are properly covered or eliminated.
  - (c) Congestion is prevented.
  - (d) Spoil is properly concealed.

p. Camouflages the CP.

- (1) Communications lines do not converge.
- (2) Vehicles are dispersed.
- (3) Turn-ins are not widened by improper use.
- (4) Protective barriers follow terrain features.
- (5) Defensive weapons are concealed.
- (6) Existing poles are used for communications lines.
- (7) CP is dug in (when in open areas).
- (8) LCSS is maintained.
- (9) Civilian buildings are properly used.
  - (a) Access and egress are controlled.
  - (b) Blackout procedures are observed.
  - (c) Obvious locations are avoided.

q. Camouflages supply points.

- (1) Operations are dispersed.
- (2) Access and egress are concealed.
- (3) Track plan is used.
- (4) Concealed loading areas are provided.
- (5) Schedule is developed and used for units being serviced.



r. Camouflages water points.

- (1) Access and egress roads are concealed.
- (2) Track plan is used.
- (3) Spillage is controlled.
- (4) Shine and reflections are controlled.
- (5) Schedule is developed and used for units being serviced.

## **Appendix B**

### **Camouflage Requirements and Procedures**

#### **Section I**

#### **Lightweight Camouflage Screen System**

**B-1. Description.** The LCSS is a modular system consisting of a hexagon screen, a diamond-shaped screen, a support system, and a repair kit. Any number of screens can be joined together to cover a designated object or area (Figure B-1). Using Figure B-2, the soldier can determine the number of modules needed for camouflaging a given area. Use Table B-1 to determine vehicle dimensions or measure the vehicle.

**B-2. Capabilities.** The LCSS conceals in four different ways:

- Casts patterned shadows that breakup the characteristic outlines of an object.
- Absorbs and scatters radar returns (except when radar-transparent LCSS is used).
- Dissipates infrared radiation.
- Simulates color and shadow patterns that are commonly found in a particular region.

**B-3. Erection.** When erecting the LCSS, keep the net structure as small as possible. Maintain the netting at a minimum of two feet from the camouflaged object's surface and avoid eye-catching steeples and shadows. Lines between support poles should be gently sloped so that the net blends into its background. The net should extend completely to the ground to prevent creating unnatural shadows that are easily detected. Doing this will ensure the LCSS effectively disrupts the object's shape and actually absorbs and scatters radar energy. The net should extend all the way around the object to ensure complete protection from enemy sensors.

**B-4. Supplemental Camouflage.** The LCSS will rarely be used without supplemental camouflage. The LCSS does not make an object invisible. Other camouflage techniques are necessary to achieve effective concealment. Cover or remove all of the object's reflective surfaces (such as mirrors, windshields, and lights). Ensure that you disrupt or disguise an object's shadow when camouflaging.

**B-5. Training.** Units should develop and practice battle drills that cover the requirements and procedures for erecting the LCSS over assigned equipment. See the sample battle drill at the end of this appendix. TM 5-1080-200-13&P contains additional information on maintenance, erection, and characteristics of LCSS.

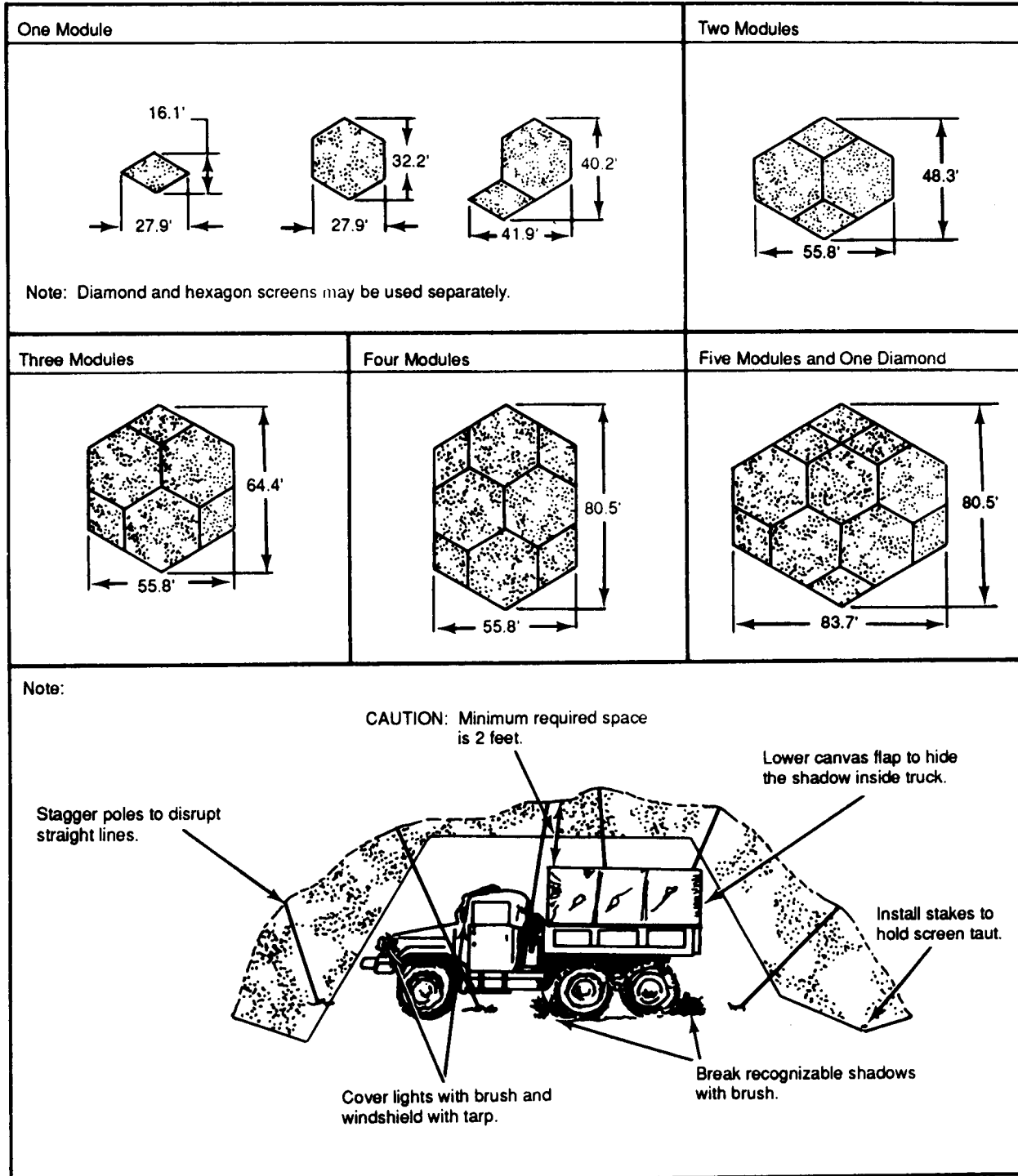
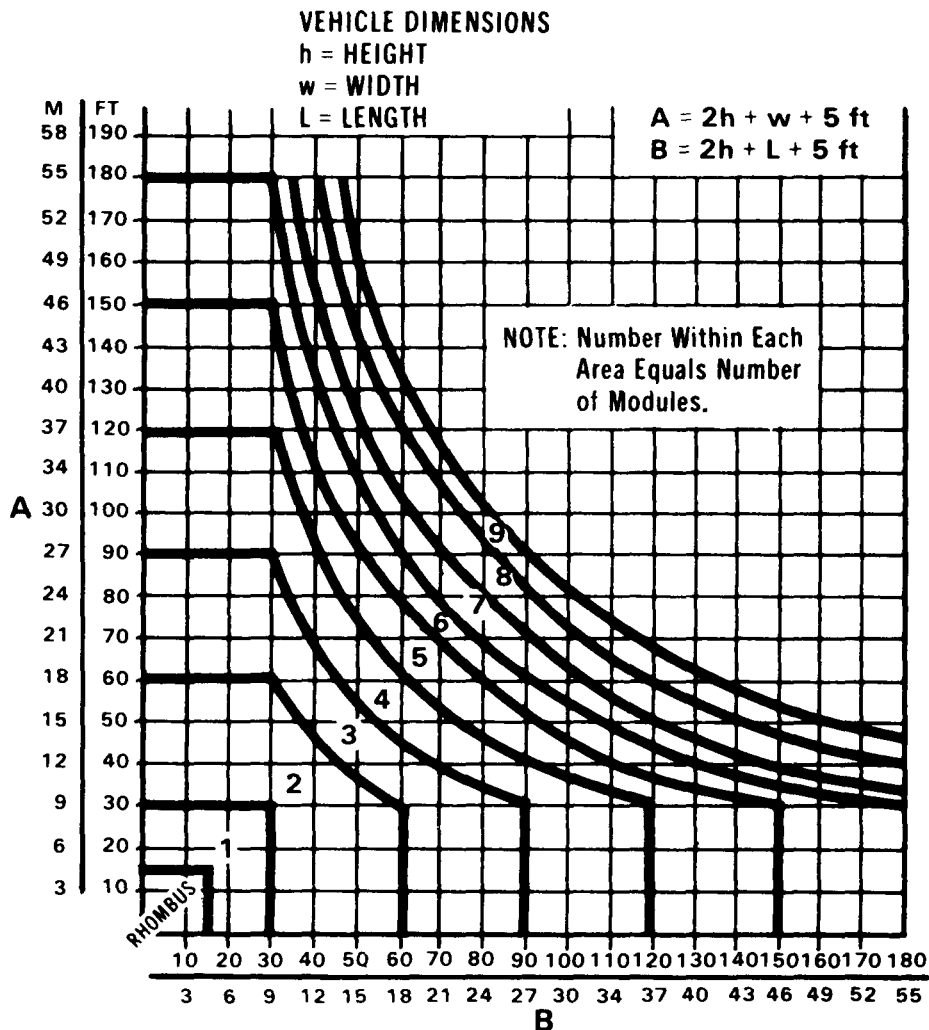


Figure B-1. LCSS Modular System



**NOTE:** This chart is normally reliable for vehicles of regular configuration. Vehicles of irregular configuration such as artillery pieces or cranes may require additional modules.

**EXAMPLE:** To determine the number of modules necessary to cover an M2 fighting vehicle, do the following:

**Step 1.** Determine the vehicle dimensions (measure or use Table B-1): *h* is 10 feet, *w* is 11 feet, and *L* is 22 feet.

**Step 2.** Substitute values into the equations in the equations above:

$$A = 2h + w + 5 = 2(10) + 11 + 5 = 36 \text{ feet}$$

$$B = 2h + L + 5 = 2(10) + 22 + 5 = 47 \text{ feet}$$

**Step 3.** Using the values for *A* and *B*, determine the number of modules required from the graph above. Since *A* equals 36 and *B* equals 47, you will require two modules of camouflage to cover the M2 fighting vehicle.

Figure B-2. Module Determination Chart

Table B-1. Vehicle Dimensions for Selected Vehicles

<b>Nomenclature</b>	<b>Height (Feet)</b>	<b>Width (Feet)</b>	<b>Length (Feet)</b>
AVLB	17	13	37
M548 Carrier, Cargo, 6-Ton	10	9	21
M577A1 Carrier, Command Post	9	9	19
M125A1 Carrier, Mortar, 81mm	7	9	16
M106A1 Carrier, Mortar, 107mm	7	10	16
M113A2 Carrier, Personnel	7	9	16
M3 Fighting Vehicle, Cavalry	10	11	22
RT Crane, Boom, 20-Ton	14	11	44
MT-250 Crane Hydraulic, 25-Ton	10	8	45
D7 Dozer, with Blade	10	12	19
M109A3 Howitzer, 155mm, (SP)	11	12	30
M2 Fighting Vehicle, Infantry	10	11	22
M2 TOW Vehicle, Improved	11	9	15
C7 Loader, Scoop, 2.5-Ton, without Cage	9	9	25
MLRs	9	10	23
M992 CATV (FAAS-V)	11	11	23
M1 Tank, Combat, 105mm	10	12	28
M48A5 Tank, Combat, 105mm	11	12	27
M60A1 Tank, Combat, 105mm	11	12	27
M60A2 Tank, Combat, 105mm	11	12	25
M60A2 Tank, with Mine Roller (10-Ton)	11	13	37
M60A3 Tank, Combat, 105mm	11	12	27
M172 Trailer, Low-Bed, 25-Ton	6	10	35
M149 Trailer, Water, 400-Gallon	6	7	7
M713 Truck, Ambulance, 1/4-Ton	7	6	12

Table B-1. Vehicle Dimensions for Selected Vehicles (continued)

<b>Nomenclature</b>	<b>Height (Feet)</b>	<b>Width (Feet)</b>	<b>Length (Feet)</b>
M792 Truck, Ambulance, 1.5-Ton	8	7	19
M977 Truck, Cargo, HEMTT	9	8	34
M880 Truck, Cargo, 1.25-Ton	8	7	19
M35A2 Truck, Cargo, 2.5-Ton	9	8	23
M54A2 Truck Cargo, 5-Ton	10	8	26
M520 Truck, Cargo, 8-Ton	11	9	32
M930 Truck, Dump, 5-Ton	9	8	24
M559 Truck, Fuel, 2,500-Gallon	11	9	33
M978 Truck, Tanker, HEMTT	9	8	34
M920 Truck, Tractor, 20-Ton	12	11	27
M151A2 Truck, Utility, 1/4-Ton	6	5	11
M816 Truck, Wrecker, 5-Ton	10	8	30
M553 Truck, Wrecker, 10-Ton	11	9	33
M9 Vehicle, Armored Combat Earthmover	9	13	21
M728 Vehicle, Combat Engineer, (CEV)	11	12	29
M578 Vehicle, Recovery, Light	11	10	21
M88A1 Vehicle, Recovery, Medium	10	11	27

## Section II

### Sample Camouflage Battle Drill (Infantry Fighting Vehicle, M2)

#### Standards

Complete camouflage net setup drills within 20 minutes.

Complete camouflage net teardown drills within 15 minutes.

#### Personnel Required

Three crew members

#### Equipment Required

Net, hexagonal      2

Net, diamond        2

Pole section        24

Stakes                36

Lanyards            6

Spreaders           12

or

Two modules

#### Stowage Location

LCSS is strapped to trim vane, right side.

#### Setup Drill

1. Gunner and assistant gunner remove camouflage net from trim vane and place on top of M2.
2. Driver removes poles and stakes from bag and places them around vehicle.
3. Gunner and assistant gunner remove vehicle antennae, position net on top of vehicle, and roll net off the sides of the vehicle.
4. Driver stakes net around vehicle.
5. Driver and assistant gunner assemble poles and spreaders and erect the net.

6. Gunner inspects the camouflage from a distance, crew adjusts the camouflage as necessary.

### **Teardown Drill**

1. Driver and assistant gunner take down and disassemble poles and spreaders.
2. Gunner and assistant gunner unstack net and roll net to top of M2.
3. Gunner and assistant gunner complete rolling net on top of the vehicle and replace vehicle antennae.
4. Driver stems net on trim vane.
5. Gunner and assistant gunner store poles, spaders, and stakes on trim vane.

### **NOTES:**

1. Preassemble nets prior to placing on the M2.
2. Supplement LCSS with proper vehicle placement techniques and natural vegetation.



**Appendix C**  
**The Geneva Emblem**  
**and**  
**Camouflage of Medical Facilities**

**This appendix implements STANAG 2931 OP, Edition 1.**

NATO Standardization Agreement (STANAG) 2931 OP covers procedures for using the Geneva emblem and camouflaging land medical facilities. This STANAG requires signatories to display the Geneva emblem (red cross) on medical facilities to help identify and protect the sick and wounded. STANAG 2931 OP defines *medical facilities* as medical units, medical vehicles, and medical aircraft on the ground. All signatories, however, are allowed to display the Geneva emblem according to their national regulations and procedures.

A tactical commander may order the camouflage of medical facilities, to include the Geneva emblem, when he judges that the failure to camouflage will endanger or compromise tactical operations. Such an order is considered temporary and must be rescinded as soon as the tactical situation permits. The camouflage of large, fixed medical facilities is not envisaged under the guidelines of STANAG 2931 OP.

## Appendix D

### Individual Camouflage

#### D-1. Description.

a. *Responsibility.* Each soldier is responsible for camouflaging himself, his equipment, and his position. Camouflage will reduce the probability of the enemy placing aimed fire on the soldier.

b. *Materials.* The soldier uses natural and artificial materials for camouflage. Natural camouflage includes defilade, grass, bushes, trees, and shadows. Artificial camouflage includes BDUs, LCSS, skin paint, and natural materials removed from their original positions. To be effective, artificial camouflage must blend with the natural background.

c. *Camouflage Discipline.* Noise, movement, and light discipline all contribute to individual camouflage. Effective noise discipline muffles and eliminates sounds made by soldiers and their equipment. Movement discipline minimizes movement within and between positions and limits movement to routes that cannot be readily observed by the enemy. Light discipline controls the use of lights at night. Examples are not smoking in the open or walking around with a flashlight on.

d. *Dispersal.* Dispersal, the spreading of soldiers and equipment over a wide area, is a key, individual survival technique. It creates a smaller target mass for enemy sensors and weapon systems. Dispersal, therefore, not only reduces casualties and losses in the event of an attack but also makes enemy detection efforts more difficult.

**D-2. Camouflage Considerations.** Every soldier should have a detailed understanding of the recognition factors described in Chapter 3. While all of these factors remain important when applying individual camouflage, some are of critical concern.

a. *Movement.* Movement draws attention, whether it involves vehicles on the road or individuals walking around positions. The naked eye, as well as infrared and radar sensors, can detect movement. Soldiers should minimize movement while they are in the open. They should remember that darkness does not prevent observation by an enemy equipped with modern sensors. When movement is necessary, slow, smooth movement attracts less attention than quick, irregular movement.

b. *Shape.* The soldier should use camouflage materials to break up the shapes, outlines, and shadows of positions and equipment, as all three are revealing factors. As shadows can visually mask objects, soldiers should stay in shadows whenever possible, especially when moving. When conducting operations close to the enemy, disguise or distort the shape of the helmet and the human body with artificial camouflage materials, as they are easily recognized by the enemy at close range.

c. *Shine and Light.* Gloss or shine can also attract attention. Pay particular attention to gloss and shine caused by light reflecting from smooth or polished surfaces, such as mess kits, mirrors, spectacles, watch crystals, windshields, and starched uniforms. Plastic map cases, dust goggles worn on top of the helmet, and clear plastic garbage bags also reflect light almost as well as windshields and mirrors. Cover or remove these items from exposed areas. Vehicle headlights, taillights, and safety reflectors not only reflect light, but also reflect laser energy used in weapon systems. Cover this equipment when the vehicle is not in operation.

Red filters on vehicle dome lights and flashlights, while designed to protect the soldier's night vision, are extremely sensitive to detection by night vision devices. A tank's red dome light, reflecting off the walls and out through the sight and vision blocks, can be seen from as far as 4 kilometers away with a starlight scope. Red-lensed flashlights, as well as cigarettes and pipes, are equally observable. To reduce the chances of detection, soldiers should replace red with blue-green filters and practice strict light discipline. Soldiers should also use measures to prevent shine at night, because moonlight and starlight can be reflected as easily as sunlight.

d. *Color.* The contrast of skin, uniforms, and equipment with the background helps the enemy to detect opposing forces. Individual camouflage should blend with the surroundings; or at a minimum, objects must not contrast with the background. Therefore, the proper camouflage technique is to blend colors with the background or to hide objects with contrasting colors.

**D-3. How to Camouflage.** Before camouflaging himself, his equipment, and his position, a soldier should study the nearby terrain and vegetation. His reconnaissance should incorporate an analysis of the camouflage considerations listed above. He then chooses camouflage materials that best blend with the area. When moving from one area to another, change camouflage as required. What works well in one location may draw fire in another.

a. *Skin.* Exposed skin reflects light and may draw attention. Even very dark skin, because of natural oils, will reflect light. Camouflage paint sticks cover these oils and also provide blending with the background. Avoid using oils or insect repellent to soften the paint stick because doing so defeats the purpose by making the skin shiny. Soldiers applying camouflage paint should work in pairs and help each other. Self-application may leave gaps, such as behind the ears. Paint high, shiny areas (forehead, cheekbones, nose, ears, and chin) with a dark color. Paint low, shadow areas with a light color. Paint the exposed skin on the back of the neck, arms, and hands with an irregular pattern. When camouflage paint sticks are not available, use field expedients such as burnt cork, bark, charcoal, lamp black, or mud. Soldiers must be aware that mud contains bacteria, some of which is harmful and may cause disease or infection. Consider mud as a last priority for field-expedient paint.

b. *Uniform.* BDUs, which have a camouflage pattern, often require additional camouflage, especially when operating very close to the enemy. Soldiers should attach leaves, grass, small branches, or pieces of LCSS to their uniform and helmet. These items will assist in distorting the shape of the soldier and in blending colors with the natural background. The BDU provides visual as well as NIR camouflage. Do not starch BDUs; doing this counters the infrared properties of the

dyes. Replace excessively faded and worn BDUs because they lose their camouflage effectiveness as they wear.

*c. Equipment.* Soldiers should inspect their personal equipment to ensure that shiny items are covered or removed. Take corrective action on items that rattle or make other noises when moved or worn. Soldiers assigned equipment such as vehicles or generators should be knowledgeable of the appropriate techniques to camouflage them (Chapters 3 through 6).

*d. Individual Fighting Position.* The reader should review the procedures for camouflaging positions listed in Chapter 6, Section II. This section emphasized some of those procedures and pointed out additional considerations when camouflaging individual positions.

(1) Spoil and Camouflage Materials. While building a fighting position, soldiers should camouflage it and carefully dispose of the earth spoil. They must also remember that too much camouflage material applied to a position can actually disclose it. Soldiers should obtain camouflage materials from a dispersed area to avoid drawing attention to the position due to the Stripped area around it.

(2) Camouflage Process. Camouflage the position as it is built. To avoid disclosing a fighting position, soldiers should observe the following guidelines:

- Do not leave shiny or light-colored objects exposed.
- Do not remove shirts while in the open.
- Do not use fires.
- Do not leave tracks and other signs of movement.
- When aircraft fly overhead, refrain from looking up, as one of the most obvious features on aerial photographs is the upturned faces of soldiers.

(3) Inspection. When camouflage is complete, inspect the position from the enemy's viewpoint. Check camouflage periodically to see that it stays natural looking and conceals the position. When camouflage materials become ineffective, change or improve them.

## Glossary

<i>AFV</i>	armored fighting vehicle
<i>AVLB</i>	armored vehicle launch bridge
<i>BDU</i>	battle-dress uniform
<i>camouflage</i>	Camouflage is the use of concealment and disguise to minimize detection or identification of troops, weapons, equipment, and installations. It includes taking advantage of the immediate environment, as well as using natural and artificial materials.
<i>CATV</i>	community antenna television
<i>CEV</i>	combat engineer vehicle
<i>Chaff</i>	Chaff is material that consists of thin, narrow metallic strips of various lengths and frequency responses, used to reflect echoes and confuse opponents.
<i>C<sup>3</sup>CM</i>	Command, control, and communications countermeasures. The integrated use of operations security, military deception, jamming, and physical destruction, supported by intelligence, to deny information; to influence, degrade, or destroy adversary command, control, and communications (C <sup>3</sup> ) capabilities; and to protect friendly C <sup>3</sup> capabilities against such action.
<i>cm</i>	centimeter
<i>COMSEC</i>	communications security
<i>CM and CB</i>	countermortar and counterbattery
<i>concealment</i>	Concealment is the protection of personnel and equipment from observation or surveillance.
<i>corner reflector</i>	An object that, by reflecting multiple signals from smooth surfaces, produces a radar return of greater magnitude than might be expected from the size of the object the reflector conceals.
<i>counterreconnaissance</i>	Counterreconnaissance is all measures taken to prevent hostile observation of a force, area, or place.

<i>countersurveillance</i>	Countersurveillance is all measures, active or passive, taken to counteract hostile surveillance.
<i>cover</i>	Cover is any natural or artificial protection from enemy observation and fire.
<i>covered approach</i>	A covered approach is any route that offers protection against enemy observation or fire.
<i>CP</i>	command post
<i>DA</i>	Department of the Army
<i>deceive</i>	To deceive is any action to cause the enemy to believe the false or to purposely cause the enemy to make incorrect conclusions based on false evidence.
<i>deception</i>	Deception is any action that misleads opposing forces and induces them to do something counter to their interests. It includes manipulating, distorting, or falsifying information available to the enemy to ensure security to friendly plans, operations, or activities.
<i>decoy</i>	An imitation, in any sense of person, object, or phenomenon, that is intended to deceive enemy surveillance devices or mislead enemy evaluation.
<i>detection</i>	Detection is the discovery of an existence or presence.
<i>disguise</i>	Any alteration of identity cues for items, signals, or systems sufficient to cause misidentification by the enemy.
<i>disrupt</i>	Disruption is any action intended to interrupt the shape or outline of an object or individual, making it less recognizable.
<i>dispersion</i>	The spreading or separating of a force and its installations to reduce vulnerability to enemy actions.
<i>ECM</i>	Electronic countermeasures. Electronic countermeasures are any action involving prevention or reduction of an enemy's effective use of the electromagnetic spectrum. Electronic countermeasures include electronic jamming and electronic deception.
<i>ECCM</i>	Electronic counter-countermeasures. ECCM is any action involving effective use of the electromagnetic spectrum by friendly forces, despite the enemy's use of electronic warfare.
<i>EHF</i>	extremely high frequency

---

<i>electronics security</i>	Electronics security is the protection resulting from all measures designed to deny unauthorized persons information of value that, when analyzed, might alert the enemy to the intentions of friendly forces (for example, signal security provided by encryption equipment).
<i>electronic warfare</i>	Any military action involving the use of electromagnetic energy to determine, exploit, reduce, or prevent hostile use of the electromagnetic spectrum, action which retains friendly use of the electromagnetic spectrum.
<i>EM</i>	electromagnetic
<i>FAAS-V</i>	field artillery ammunition support vehicle
<i>FEBA</i>	forward edge of the battle area
<i>FLIR</i>	forward-looking infrared
<i>FLOT</i>	forward line of own troops
<i>FM</i>	field manual, frequency module
<i>ft</i>	foot, feet
<i>GHz</i>	gigahertz
<i>GSR</i>	ground-surveillance radar
<i>h</i>	height
<i>HEMTT</i>	heavy expanded mobility tactical truck
<i>HF</i>	high frequency
<i>hiding</i>	Hiding is using choice of position or materials to obstruct direct observation.
<i>HQ</i>	headquarters
<i>intervisibility</i>	Intervisibility is the condition of the atmosphere that allows soldiers the ability to see from one point to another. This condition may be altered or interrupted by weather, smoke, dust, or debris.
<i>IP</i>	initial point
<i>IPB</i>	Intelligence preparation of the battlefield. IPB is a systematic approach to analyzing the enemy, weather, and terrain in a specific geographic area. It integrates enemy doctrine with the weather and terrain conditions as they relate to the mission and the specific battlefield environment. IPB provides the framework for determining and evaluating enemy capabilities, vulnerabilities, and probable courses of action.

<i>IR</i>	infrared
<i>KHz</i>	kilohertz
<i>km</i>	kilometer
<i>kph</i>	kilometer per hour
<i>l</i>	length
<i>LCSS</i>	Lightweight Camouflage Screening System
<i>LF</i>	low frequency
<i>LLTV</i>	low-light television
<i>m</i>	meter
<i>METT-T</i>	mission, enemy, terrain, troops, and time available
<i>MF</i>	medium frequency
<i>MHz</i>	megahertz
<i>MLR</i>	multiple launch rocket
<i>movement techniques</i>	The methods used by a unit to travel from one point to another (traveling, traveling overwatch, and bounding overwatch) are considered movement techniques. The likelihood of enemy contact determines which technique is used.
<i>mm</i>	millimeter
<i>MTI</i>	moving target indicator
<i>NATO</i>	North Atlantic Treaty Organization
<i>NBC</i>	nuclear, biological, chemical
<i>NCO</i>	noncommissioned officer
<i>NIR</i>	near infrared
<i>obscuration</i>	The effects of weather, battlefield dust, and debris; the use of smoke munitions to hamper observation and target acquisition; or the concealment of activities or movement.
<i>OP</i>	operational procedures
<i>OPFOR</i>	opposing force



<i>OPSEC</i>	Operations security. OPSEC is the process of denying adversaries information about friendly capabilities and intentions by identifying, controlling, and protecting signatures associated with planning for and conducting military operations and other activities. It includes countersurveillance and physical, signal, and information security.
<i>POL</i>	petroleum, oils and lubricants
<i>radar</i>	Radar is a device that uses electromagnetic waves to provide information on the range, azimuth, or elevation of objects.
<i>radar camouflage</i>	Radar camouflage is any radar-absorbent or -reflecting material that changes the radar-echoing properties of an object's surface.
<i>radar clutter</i>	Unwanted signals, echoes, or images displayed by a radar unit, which interfere with the observation of desired signals.
<i>radar imagery</i>	The picture produced on radar screen by recording the electromagnetic waves reflected from a given target surface.
<i>radio detection</i>	The detection of a radio's presence by intercepting its signals without precise determination of its position.
<i>radio direction-finding</i>	The act of determining the azimuth to a radio transmitter, from a specific location, using signal-detecting equipment.
<i>radio fix</i>	A radio fix is the location of a radio transmitter determined by simultaneously using two direction-finding devices stationed at different locations and plotting the results on a map. The intersection of the two azimuths indicates the transmitter's location.
<i>radio range-finding</i>	Radio range-finding is the act of determining the distance to a radio transmitter. This technique involves using electronic equipment to intercept and measure a transmitter's emissions and translating this information into a distance.
<i>RAM</i>	radar antidetection materials
<i>RATELO</i>	radiotelephone operator
<i>reconnaissance</i>	Reconnaissance is an exploratory survey of a particular area or airspace by visual, aural, electronic, photographic, infrared, or other means. It may imply a physical visit to the area.
<i>reverse-slope position</i>	A position on the ground that is not exposed to direct fire or observation. It may be a slope that descends away from the enemy.
<i>RSTA</i>	reconnaissance, surveillance, and target acquisition
<i>S2</i>	Intelligence Officer (U.S. Army)

<i>SCSPP</i>	standard camouflage screening paint patterns
<i>SHF</i>	superhigh frequency
<i>signature</i>	Signatures are the visible or audible indications that forces are occupying or operating in an area. Signatures may include noise, smoke, flame, heat, vehicle tracks, debris, spoil, and radio and radar emissions.
<i>SLAR</i>	side-looking airborne radar
<i>smoke</i>	Smoke is an artificially produced aerosol of solid, liquid or vapor deposited in the atmosphere which inhibits the passage of visible light or other forms of electromagnetic radiation.
<i>STANAG</i>	standardization agreement
<i>SOP</i>	standing operating procedure
<i>SP</i>	self-propelled
<i>surveillance</i>	Surveillance is a systematic observation of airspace or surface areas by visual, aural, electronic, photographic, infrared, or other means.
<i>survivability operations</i>	Survivability operations are activities involving development and construction of fighting and protective positions (such as earth berms, dug-in positions, and overhead protection and camouflage that reduces the effectiveness of enemy detection systems.
<i>target acquisition</i>	Target acquisition is the process involving detection and identification of hostile operations or equipment for subsequent destruction.
<i>terrain analysis</i>	Terrain analysis is the process of examining a geographic area to determine what effects its natural and man-made features may have on military operations.
<i>terrain mottling</i>	Terrain mottling is a camouflage technique normally used in desert terrain. It involves scarring the earth with heavy equipment to expose patches of bare ground. Equipment and supplies are placed on these bare patches to avoid detection by aerial reconnaissance.
<i>TM</i>	technical manual
<i>TOW</i>	tube-launched, optically tracked, wire-guided
<i>TRADOC</i>	Training and Doctrine Command
<i>UHF</i>	ultrahigh frequency
<i>US</i>	United States
<i>UV</i>	ultraviolet

*VHF* very high frequency

w width

## References

### SOURCES USED

These publications are the sources quoted or paraphrased in this publication.

#### International Standardization Agreement

STANAG 2931 OP (Edition 1). *Camouflage of the Geneva Emblem on Medical Facilities on Land*. October 1984.

#### Army Publications

FM 3-50. *Deliberate Smoke Operations*. July 1984.

FM 5-34. *Engineer Field Data*. September 1987.

FM 90-2. *Battlefield Deceptions*. October 1988.

FM 90-13. *River Crossing Operations*. July 1990.

TM 5-1080-200-13&P. *Operator's, Organizational and Direct Support Maintenance Manual . . . Lightweight Camouflage Screening Systems and Support Systems*...January 1987.

#### Nonmilitary Publications

Friedman, Richard S., COL, U.S. Army; Gunston, Bill; Hobbs, David; Miller, David, LTC, British Army; Richardson, Doug; Walmer, Max; *Advanced Technology Warfare*, New York: Crown Publishers, Inc. 1987.

### READINGS RECOMMENDED

These readings contain relevant supplemental information.

#### International Standardization Agreement

STANAG 2027 M&T (Edition 3). *Marking of Military Vehicles*. December 1975.

## **Army Publications**

FM 3-100. *NBC Operations*. September 1985

FM 5-103. *Survivability*. June 1985

FM 21-10. *Field Hygiene and Sanitation*. November 1988

FM 21-26. *Map Reading and Land Navigation*. September 1987.

FM 24-33. *Communications Techniques: Electronic Counter-Countermeasures*. March 1985.

FM 34-1. *Intelligence and Electronic Warfare Operations*. July 1987.

FM 34-3. *Intelligence Analysis*. January 1986

FM 90-10. *Military Operations on Urbanized Terrain (MOUT) (How to Fight)*. August 1979

TM 43-0139. *Painting Instructions for Army Materiel*. July 1988

## Index

This is a topical index organized alphabetically. Citations are to page numbers.

- acoustic sensors, 2-4, 3-3
- acquisition, of targets, 2-1
- aerial photography, 1-4
- analysis, IPB, 3-1, 4-1
- analysis, terrain, 1-3
- antennae, 7-1, 7-2
- artificial materials, 4-2
- assembly areas, 5-1, 6-2
  
- backgrounds, 6-4
- barren terrain, 3-6
- battle drills, 1-2, B-6
- blending, 3-7
- breaching operations, 5-4
  
- camouflage
  - applying realistic, 3-2
  - assembly areas, 5-2, 6-2
  - concepts, 3-1
  - considerations, 5-1, 7-3
  - discipline, 3-7, 4-3, 6-3, 7-2
  - offensive preparations, 5-1
  - defensive preparations, 6-1
  - during battle, 5-3, 6-4
  - fundamentals, 3-1
  - Geneva Emblem, C-1
  - high-value targets, 7-1
  - individual, 5-2, D-1
  - medical facilities, C-1
  - movement, 3-4, 5-2, 6-2, 8-2
  - natural, 4-1
  - paint, 8-2
  - plans, 7-6, 8-3
  - preparations, 5-1, 6-1
  - principles, 3-6
  - priorities, 1-2
  - camouflage (continued)
    - special environments, 8-1
    - techniques, 4-1
  - classification, sensors, 2-2
  - CM and CB radar, 2-4
  - collection, data, 2-1, 4-2
  - color, 3-5
  - command posts (CPs), 7-1
  - communications, 6-3, 7-1
  - concealment, 3-6
  - concepts, camouflage, 3-1
  - conditions, natural, 4-1
  - considerations
    - doctrinal, 1-1,
    - movement, 3-4, 5-3, 6-2
    - water point, 7-3
  - control, traffic, 5-3, 7-1, 7-3
  - counterattack
    - forces, 6-1
    - force placement, 6-3
  - counterdetection techniques, 4-1
  - countermeasures, 3-2
  - CPs, 7-1
  - crossings, line, 5-3, 7-1
  
  - data
    - collection, 2-1
    - sources, 4-2
  - dead space, 4-1
  - deception, operations, 5-3
  - decoys, 3-4, 5-2, 6-4
  - defense, preparations, 6-1
  - desert, 8-1
  - detection
    - avoiding, 3-1, 3-2
    - by surveillance, 3-2
    - factors, 3-4
    - preventing, 1-1

- discipline
  - camouflage, 3-7, 4-3, 6-3, 7-2
  - heat, 6-3
  - heat-source, 3-7
  - light, 3-7, 8-2
  - movement, 3-4, 3-5, 5-3, 6-2, 8-2
  - noise, 3-7, 8-2
  - spoil, 3-8
- disguising, 3-7
- dispersion, 3-6
- disrupting, 3-7
- doctrine, 1-1, 2-2
  - threat, 2-2
  - considerations, 1-1
- drills, battle, 1-2
- electromagnetic spectrum, 2-3
- equipment
  - pattern-painted, 4-2, 8-2
  - patterns, 3-5, 4-2, 8-2
- evaluation
  - training, 1-3
  - facilities, 7-6
- expedient paints, 4-3, 8-2
- facilities, evaluation, 7-6
- factors, 3-4
  - color, 3-5
  - movement, 3-5
  - patterns, 3-5
  - radar return, 3-6
  - shadow, 3-5
  - shape, 3-5
  - temperature, 3-5
  - texture, 3-5
- fighting positions, establishing, 8-3
- fires, 6-3
- fixed installations, 7-4
- flash-sound ranging, 2-4
- FLIR, 2-3
- forces
  - counterattack, 6-1
  - placement, 6-3
  - reserve, 6-1
- forests, 4-1
- fundamentals, camouflage, 3-1
- Geneva Emblem, camouflage of, C-1
- guidelines, SOPs, A-1
- halts, 5-3
- heat discipline, 6-3
- heat-source, 3-7
- hiding, 3-6
- high-value targets, 7-1
- identifying
  - priorities, 1-2
  - sensors, 2-2
  - Threat, 3-1
- improving
  - deception capabilities, 1-1
  - survivability, 1-1
- individual
  - camouflage, D-1
  - training, 1-3
- infrared
  - detection devices, 2-3
  - protection, 3-2
  - sensors, 2-3, 3-2
- installations, fixed, 7-4
- intelligence, production, 2-1
- intensifiers, image, 2-2
- IPB, 3-1, 4-1
- LCSS, 1-4, 4-2, 6-3, B-1
- light discipline, 3-7, 8-2
- limitations, camouflage plans, 7-7
- limited visibility, 4-2
- lines, communication, 7-1
- line crossings, 5-3
- low-light television (LLTV), 2-3
- material, 1-4, 4-2, 6-4
  - artificial, 4-2
  - natural, 6-4
- medical facilities, camouflage of, C-1
- METT-T, 1-2

- mission, 1-2, 3-6
- mobility, 7-7
- mottling, 8-1
- movement, 3-4, 3-5, 5-2, 6-2
  - assembly areas, 5-2
  - considerations, 3-4, 5-3, 6-2
  - discipline, 3-4, 5-3, 6-2, 8-2
  - orders, 5-2
  - supply, 5-2
  - troop, 5-2
- MTI, 2-4
  
- natural
  - camouflage, 4-1, 6-4
  - conditions, 4-1, 6-4
  - vegetation, 4-3, 6-4
- near-infrared, 2-3
- NIR, 2-3
- noise discipline, 3-7, 8-2
- nuclear weapons, 7-7
- nuclear-delivery units, 7-7
  
- objectives
  - camouflage plan, 7-6
  - defense, 6-1
- obstacles, survivability, 6-3
- offensive preparations, 5-1
- operational patterns, avoiding, 3-4
- operations
  - breaching, 5-4
  - deception, 5-3
  - defensive, 6-1
  - logistics, 7-3
  - offensive, 5-1
- OPFOR, 1-4
- OPSEC, 1-1, 7-1
- orders, movement, 5-2
- organization, Threat, 2-1
- overlays, terrain-factor, 4-1
  
- paint, 4-3, 8-2
- paint, expedient, 4-3, 8-2
- patrols, 2-2
- pattern-painted equipment, 4-2, 8-2
  
- patterns, 3-4, 3-5, 8-3
  - avoiding operational, 3-4
  - equipment, 3-5, 4-2
  - terrain, 3-5, 3-6
- photography, aerial, 1-4
- placement, 6-3
- placing vehicles, 5-2, 8-4
- planning, 6-1, 8-3
- plans, camouflage, 7-6
- points
  - supply, 7-3
  - water, 7-3
- positions
  - fighting, 8-3
  - survivability, 6-3
- posts
  - command, 7-1
  - observation, 2-2
- preparations, 5-1, 6-1
- preparations, camouflage, 5-1, 6-1
- preventing, detection, 1-1, 3-1, 3-4
- principles, camouflage, 3-6
- priorities, determining, 1-2
- procedures, radiotelephone, 7-2
  
- quartering parties, 5-3
  
- radar, 2-4, 3-6
  - CM and CB, 2-4
  - return, 3-6
- radio sensors, 2-5, 3-4
- radiotelephone procedures, 7-2
- raids, 2-2
- recognizing technology, 1-2
- reconnaissance, tactical, 2-1
- reserve
  - forces, 6-1
  - forces, placement, 6-3
- responsibilities, 1-2
  - commander, 1-2
  - soldier, 1-2
- rural terrain, 3-6
  
- screen system, camouflage, B-1



- scheduling, 7-4
- security
  - positions, 7-1
- selection, site, 3-6, 7-2, 8-3
- sensors, 2-2, 3-2
  - acoustic, 2-4
  - IR, 2-3
  - NIR, 2-3
  - radar, 2-4
  - radio, 2-5, 3-4
  - systems, 2-2
  - UV, 2-4
  - visual, 2-2
- shadow, 3-5
- shape, 3-5
- signatures, 1-1, 5-1, 6-1, 7-1, 7-7
- signatures, thermal, 8-2
- site, 7-2, 8-3
  - placement, 6-3, 7-2, 8-3
  - selection, 3-6, 7-2, 8-3
- SLAR, 2-4
- smoke, 4-2
- snow-covered areas, 8-2
- space, dead, 4-1
- spectrum, electromagnetic, 2-3
- speed of march, 5-2
- spoil discipline, 3-8
- SOPs, guidelines, 1-2, A-1
- stoves, 6-3
- supply
  - movements, 5-2
  - points, 7-3
- survivability
  - obstacles, 6-3
  - positions, 6-3
- systems
  - LCSS, 4-2, 6-3
  - sensor, 2-2
- target acquisition, 2-1
- techniques,
  - counterdetection, 3-1, 4-1
- technology, 1-2
- temperature, 3-5
- terrain, 3-5, 3-6, 4-1
  - barren, 3-6
  - desert, 8-1
  - mottling, 8-1
  - overlays, 4-1
  - patterns, 3-5, 4-1, 8-3
  - rural, 3-6
  - snow-covered, 8-2
  - urban, 3-6, 8-3
  - wooded, 3-6
- texture, 3-5
- thermal signatures, 8-2
- Threat, 2-1, 3-1
  - doctrine, 2-2
  - identification, 3-1
  - units, 2-1
- time, 1-3
- traffic control, 5-3, 7-1, 7-3
- training, 1-3
- troop movements, 5-2, 6-2
- troops, 1-3, 2-1
- ultraviolet sensors, 2-4, 3-2
- urban
  - camouflage, 8-3
  - terrain, 3-6, 8-3
- vegetation, 4-3, 6-4
- vehicles
  - placement, 5-2, 8-4
  - camouflage, 5-2
- visibility, limited, 4-2
- visual sensors, 2-2, 3-2
- water point, considerations, 7-3
- weather, 4-2
- wooded terrain, 3-6